REPORT ON
PREINVESTMENT SURVEY OF
LAGOS FISHING PORT
PROJECT
NIGERIA

SEPTEMBER 1966

OVERSEAS TECHNICAL
COOPERATION AGENCY
GOVERNMENT OF JAPAN

REPORT ON

PREINVESTMENT SURVEY OF LAGOS FISHING PORT PROJECT NIGERIA

JICA LIBRARY
1064891[3]

SEPTEMBER 1966

OVERSEAS TECHNICAL
COOPERATION AGENCY
GOVERNMENT OF JAPAN

国際協力事業団

受入月日 '84. 5.14	524
	89
登録No. 04398	SD

Foreword

The Government of Nigeria is considering the construction of a fishing port in Lagos as one of the projects to be materialized by its National Development Plan which started in 1962. The ultimate objective of this project lies in the stabilized supply of fish protein to the nation at low cost.

The Government of Japan, which decided to perform a preinvestment survey of the fishing port project as its technical cooperation, has entrusted the task to the Overseas Technical Cooperation Agency.

The Agency organized a Survey Mission, headed by Mr. Yutaka Kubota and composed of nine members, which was despatched to Lagos on February 15, 1966.

The Survey Mission in its field work extending over thirty-seven days, conducted various investigations such as the gathering of necessary data, the inspection of the fish market, the reconnaissance of the proposed site and the investigation of the geology. The Mission since its return to Japan at the end of March, has been engaged in the reviewing of the data, planning of the port, calculation of the design material, cost estimation etc., and is now ready to submit its survey report.

The present report treats of technical and economic study of the Lagos Fishing Port Project.

Nothing would be more gratifying to the Agency if this report could contribute to the materialization of the project as well as to the promotion of the amicable relations and economic intercourse between Nigeria and Japan.

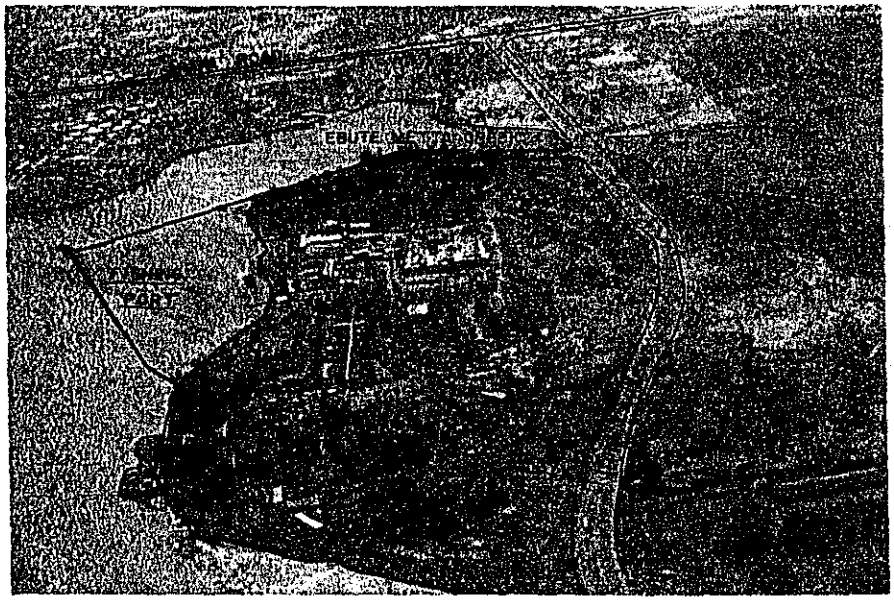
The Agency, in conclusion, takes this opportunity to express its deep sense of gratitude for the ungrudging cooperation and support extended by the authorities of the Government of Nigeria, the international organs concerned,

Japanese Embassy in Lagos and the members of the Survey Mission.

S. Shibusawa

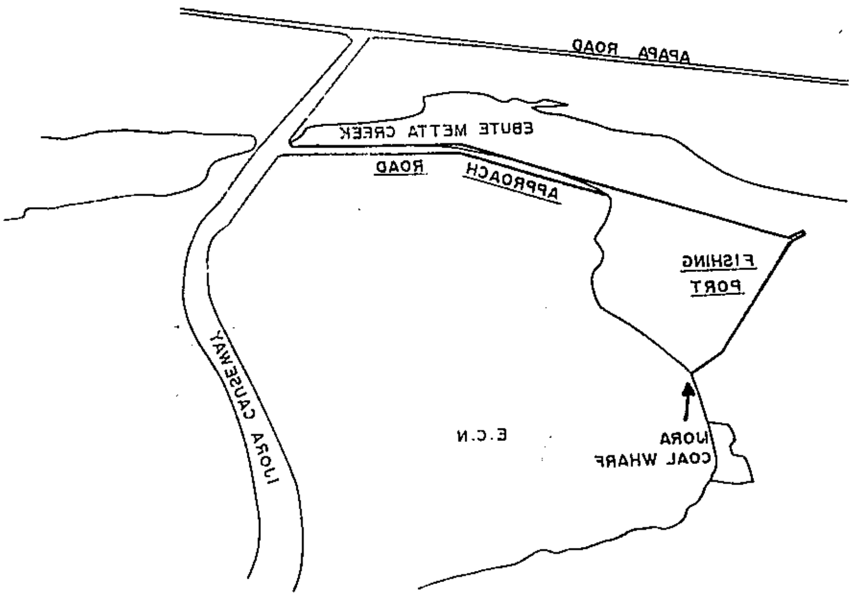
Sin-ichi Shibusawa
Director-General

Overseas Technical
Cooperation Agency

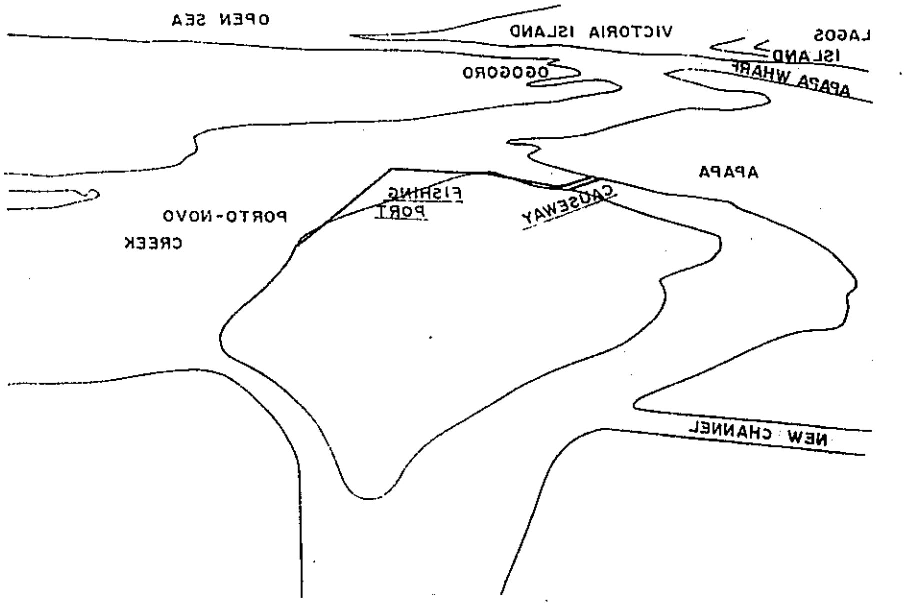


IJORA SITE
(Aerial Photo)

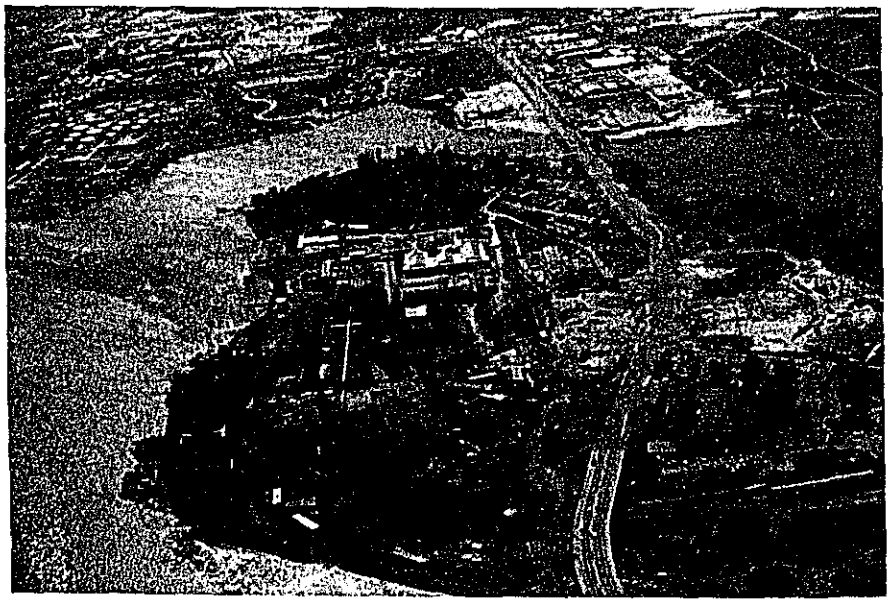
TIN CAN ISLAND SITE
(Aerial Photo)



IJORA SITE
(Aerial Photo)



TIN CAN ISLAND SITE
(Aerial Photo)



REPORT ON PRINVESTMENT SURVEY OF LAGOS FISHING PORT PROJECT

CONTENTS

APPENDICES

LIST OF DATA

1. Annual Abstract of Statistics, Nigeria, 1964

2. Digest of Statistics, Vol. 14

3. National Development Plan, PROGRESS REPORT, 1964

4. Review of the Federal Government
   Capital Expenditure Programme, 1962-68
   (OPERATIONAL CAPITAL EXPENDITURE PROGRAMME, 1965-68)

5. Economic and Functional Analysis of Government
   Accounts, 1958/59 -- 1961/62

6. Urban Consumer Surveys in Nigeria

7. Federal Government Development Programme, 1962-68

8. Federal Ministry of Trade, Nigeria
   Annual Report, 1964, by Nigerian Stored Products
   Research Institute

9. Review of External Trade, Nigeria, 1964

10. Annual Report of the Federal Institute of Industrial
    Research, 1962-63

11. Industrial Survey, Nigeria, 1962

12. Statement on Industrial Policy, Sessional Paper No. 6 of 1964

13. Report of the Accountant-General of the Federation together with
    Financial Statements for the Year ended 31st March, 1964

14. Estimates of the Government of the Federal Republic of Nigeria,
    1964-65

15. Report of the Fiscal Review Commission by K. J. Binns, Commissioner

16. The Laws of the Federation of Nigeria and Lagos in force on the 1st day
    of June, 1958, Revised Edition, Chapter 85, Income Tax

17. Sea Fisheries (Lagos) Act, 1961
    Wireless Telegraphy Act, 1961
    Flags and Coats of Arms (Amendment) Act, 1961
    Civil Liability (Miscellaneous Provisions) Act, 1961
    Fatal Accidents Act, 1961
    Nigerian Broadcasting Corporation (Amendment) Act, 1961
    Road Traffic (Amendment) Act, 1961
    Water Rates Recovery (Government Tenants) Act, 1961
    Export of Nigerian Produce (Amendment) Act, 1961

Pensions (Amendment) Act, 1961

18. Annual Report, 1963-64, Nigeria Delta Development Board

19. Report of the Federal Fisheries Service, 1961-62 and 1962-63

20. Report on the Fisheries of Nigeria, 1961 by A. R. Longhurst

21. Over Fishing in Lagos - Proposed Cure by E. O. Beyagbone

22. A Survey of the Fish Resources of the Eastern Gulf of Guinea, by Alan Longhurst (Extrait du Journal du Conseil International pour L'Exploration de la Mer, Vol. XXIX. No. 3, 1965)

23. The Fishery Potential of a Lagos-based in-shore fleet (A brief to the Japanese Survey Team Visiting Nigeria) by E. O. Bayagbona, Feb. 18, 1966

24. Prawn Industry for Nigeria
By Mr. D. F. S. Raitt and Mr. D. R. Niven
(Printed from FISHING NEWS INTERNATIONAL, Vol. 4, No. 4, 1965)

LIST OF DRAWINGS

LIST OF PHOTO

SUMMARY & RECOMMENDATION

In its National Development Plan (1962 - 1968) the Government of Nigeria appropriated a fund for construction of a fishing port in Lagos.

The Mission understands that the object of this plan consists primarily in the supply to the nation of sufficient fish at reasonable prices to promote its nutritive conditions; the plan seems, at the same time, to aim, for its secondary object, at the development of Nigerian fishing and various related industries.

The summarized view of the Mission on the fishing port project in Lagos based on the study of the present situation of fisheries and fish market in the country is as follows:-

The nation's demand for fish will undoubtedly increase because of its expected economic development and increase in population in future, but realization of increase in the production and supply of fish to meet the increase of the demand involves a number of difficulties.

Construction of a new fishing port will be a great help to the betterment of the conditions for fish supply, because at present Lagos lacks in proper fishing port facilities and it causes inconvenience to fishing boats, especially to the loose chartered foreign vessels.

In the light of such situation, the Mission, considering various data and information, assumed the amount of frozen fish to be handled in the fishing port of Lagos around 1970 at about 40,000 tons, and has formulated this construction plan just to match the said amount. However, the plan allows future expansion if it becomes necessary.

As for the location of the fishing port, the Mission made a comparative study of several proposed sites, and, as a result, two places, Tin Can Island

and Ijora, are considered qualified and, in the Mission's opinion, the latter is more worth recommendation.

The reason for this is as follows:-

It is true that Tin Can Island has the advantage over Ijora in that its ground would leave an area to be developed when it is necessary for use other than for fishing port facilities, but, so far as the construction cost, accessibility from land and sea, etc. are concerned, Ijora is more advantageous.

Construction costs of both sites are shown below.

Item	Ijora Site	Tin Can Island
Dredging of the channel and harbour basin	£ 240,000	£ 560,000
Reclamation and land preparation	340,000	260,000
Construction of quay walls and bulkhead	440,000	360,000
Road construction	120,000	400,000
Water, oil and power supply	60,000	60,000
Office building and sheds	100,000	100,000
General expenses and engineering services	200,000	250,000
Contingency & reserve including interest during construction	400,000	510,000
Total	£ 1,900,000/1	£ 2,500,000/2

/1 The construction cost of £1,900,000 has been estimated on the assumption of existence of shale rock at the site. If no shale rock is found the construction cost will be lowered.

/2 Though the cost of £2,500,000 is over the £2,000,000 of the Operational Capital Expenditure Programme, 1965-68, the former includes the construction costs of "the quay and the facilities required at the fishing port" which are not included in the latter.

Since the Mission has not, in its survey, made a detailed study of the geology and hydrology of the place, it will be necessary for the realization of the fishing port project to make a further investigation in order to determine the detailed construction design and estimate cost of construction.

As the construction cost of the basic facilities of a fishing port such as the quay, channel, basin, etc. generally amounts to a large sum in most cases, it is impossible to recover this cost by such earnings as the port charges, wharfage, etc. For this reason it is customary in many countries that such facilities are financed and run by government investment in the form of the so-called social capital overhead.

As regards the present project, it is feared that the construction cost will be too great to be covered by the direct earnings alone; but, from the standpoint of national interest, it is hardly necessary to say that it will bring immeasureable benefits to the national economy.

The main part of the report is devoted to the study of such basic facilities of the fishing port as will be built and run by public organizations. Regarding private enterprises related to the fishing port, some data are included in the appendices, but more careful study should be made for each branch.

The Mission has tried to state its opinions on the fundamental problems connected with the Terms of Reference suggested by the Nigerian Government, in the form of recommendations in PART III.

In working out any plan connected with fishery, the following outlined recommendations should be taken into consideration:

1. The canoe fishing has been making considerable contribution to the national consumption of fish with the nation's own capital, technique and manpower. The Government aid and encouragement are indispensable to the

development of the canoe fishing.

2. Regarding the pelagic fishing, there are many problems to be settled: economic, technical, operational and other fundamental problems.

3. In order to take proper measures for development of domestic fishing it is necessary to grasp the present situation, that is, to prepare and study statistics and data relative to canoes and other fishing boats, fishermen, catches, price of fish, etc.

4. The present market system is not suitable for supplying fish at reasonable price. At present the fish price fluctuates in wide range. As a countermeasure to it, for instance, a setting-up of a public market may be recommendable.

5. Establishment of a highly developed processing industry for marine products might not be economically feasible because of both the non-existence of the proper material fish (in respect to price, quantity and continuous supply) and the unfavourable economic circumstances in this country.

6. It is advisable to make efforts for securing constant landing of frozen fish.

7. There is a limit to the supply of fish. Therefore, it is absolutely necessary to develop other protein sources as well along with the development of fishery.

Introduction

1. Authority

At the request of the Government of Nigeria, the Government of Japan sent a Technical Survey Mission to Nigeria in February 1966 to undertake preinvestment survey of a fishing port to be constructed at Lagos. The survey was entrusted to the Overseas Technical Co-operation Agency, an executive agency of the Government of Japan.

2. Purpose and scope of the works

The purpose of the Mission is to perform a preinvestment survey of a fishing port project in Lagos and formulate a survey report leading to its realization.

As regards the scope of works, the Government of Nigeria suggested, upon arrival of the Mission in Nigeria, following Terms of Reference:

1. To examine in the light of available data the long term requirements of the Nigeria population for fish products.
2. To confirm the conclusions of the Federal Fisheries Service concerning the potential of fisheries resources in the coastal waters of Nigeria.
3. To assess the potential in terms of numbers of vessels and landings for a Nigerian-based, distant water trawling fleet operating on the international demersal grounds off southwest Africa and elsewhere.
4. To recommend the most suitable type, size and equipment of trawler to be utilized for the distant water fishery and indicate its most efficient operational pattern and catch preservation methods.
5. To examine the requirements of both the future inshore and distant

water trawling fleets in respect of terminal facilities and to provide specific recommendations as to the size, type and capacity of quays, market space, storage, cold stores, processing areas, fuel and water supplies, etc.

6. To appraise the suitability of the suggested locations at Tin Can Island and Badagry Creek Point and any other alternative sites in Lagos with particular attention to existent and future port development plans and to the need for scope for processing factories.

7. To survey, including soil tests, the recommended site and report the physical, economical and financial feasibility of constructing the required fisheries terminal in sufficient detail as to permit the planning of the programming and phasing of the engineering project.

8. To determine the overall viability of the proposed fisheries terminal project including in the costs justification recommended measures for collection of Revenue.

9. To assess the prospects for establishment of fish processing industries required to handle surplus catch landings and to determine the land area requirements adjacent to the fisheries terminal for their location.

During the period of the survey in Nigeria, the Mission endeavoured to fulfill the purpose of the above Terms of Reference.

The present report has been formulated from the results of the field survey and from available information and data gathered in Nigeria. The Mission believes that this report covers the Terms of Reference as

a whole, though some items are only outlined due to the short period of the investigations.

3. Composition of the Mission

The Mission under the leadership of Mr. Yutaka Kubota which includes 9 members in the fields of fishery, civil engineering and marketing, arrived in Lagos on 15th February, 1966.

The Mission consists of the following members:

Name	Post	Assignment
Mr. Yutaka Kubota	President, Nippon Koei Co., Ltd.	Chief, Overall
Mr. Yoshio Niinomi	Overseas Technical Cooperation Agency	Deputy chief, Civil engineering
Mr. Setsuo Nishimoto	Fishery Agency, Japanese Government	Fishery
Mr. Tatsuma Fukuchi	do.	Civil engineering
Mr. Yasumasa Bando	Nippon Koei Co., Ltd.	Marketing
Mr. Haruo Ueno	do.	Civil engineering
Mr. Iyomo Tajima	do.	Industry
Mr. Chikashi Oda	do.	Marketing
Mr. Soji Komatsu	Taiyo Fishery Co., Ltd.	Fishery

4. Activity of the Mission

After its arrival on 15th February 1966 in Lagos, the Mission had several discussions and meetings with the various authorities concerned with the fishery problems. During those discussions, the Mission was keenly aware of the importance given by the Government of Nigeria to the fishery problem which is given a high-ranking priority in the current National Development Plan of 1962-1968.

According to the preliminary meetings held under the Chairmanship of the Permanent Secretary of the Ministry of Agriculture and Natural Resources and attended by the representatives of various ministries and organizations concerned with the project, it was made clear that the proposed fishing port shall fall within the administrative jurisdiction of the Nigerian Ports Authority. The Mission was also requested in particular to study other alternative sites with the port extension planning taken into account which was envisaged by the Government.

The mission was divided into two working groups, one group was mainly concerned with the technical aspects of the fishing port project and the other group concentrated on the economic aspects of the fishery industry.

The investigations were undertaken broadly based on the Terms of Reference for the study of the proposed fishing port project issued by the Nigerian Authorities.

During the period of the investigations, efforts were made to reconnoiter the various alternative sites, surveys were made on their locations, accessibility, and other conditions. The Mission undertook outlined survey of geological, hydrological and topographical conditions on the most promising sites.

The Mission left Lagos on 23rd March 1966.

5. Acknowledgement

The Mission acknowledges with thanks the cooperation received from the numerous people whose help and advices have greatly facilitated its works in fulfilling the purpose of the Mission. The Mission is especially indebted to the following officials for their generous cooperation.

Mr. C.A. Ige	- Permanent Secretary, Ministry of Agriculture and Natural Resources
Mr. A.S.N. Egbo	- Ministry of Agriculture and Natural Resources
Mr. J.D.N. Ofili	- Ministry of Agriculture and Natural Resources
Mr. J.D. Gomwalk	- Ministry of Agriculture and Natural Resources
Mr. D.R. Niven	- Director of Federal Fisheries Service
Mr. J.O. Olajide	- Ministry of Economic Development
Mr. E.C. Ilozue	- Ministry of Finance
Mr. P.A. David	- Ministry of Industries
Mr. O.O. Amogu	- " "
Mr. R.C. Onyejepu	- Ministry of Works and Housing
Mr. C.H.C. Nwanya	- Ministry of Transport
Mr. S.B. Peters	- Nigerian Ports Authority
Mr. J.W. McEwen	- " " "
Mr. A. Adejumo	- Lagos Executive Development Board
Mr. S.S. Gofwen	- Ministry of Agriculture and Natural Resources (Secretary)

And

Government of Western Nigeria

Government of Eastern Nigeria

Nigeria Delta Development Board

FAO in Rome and Nigeria

USAID in Lagos

PART I

FISHERY IN NIGERIA

PART 1
FISHERY IN NIGERIA

CHAPTER 1
GENERAL CONDITIONS

1.1 General

Nigeria is one of the most populated country in Africa. About 50 million people live in an area of about 357,000 square miles. Geographically, it lies between latitude 4°N. and 14°N. and longitude 3°E. and 14°E. of the Greenwich Meridian. Nigeria is facing the Atlantic Ocean on the West Coast of Africa. It has a coastline of more than 700 miles.

1.2 Resources

Nigeria is predominantly an agricultural country. The main products are groundnut, cotton, cattle hides in the Northern part, cocoa in the Western part, timber and rubber in the Mid-Western part, palm oil and palm kernel in the Eastern part.

Other resources are coal, limestone, iron ore, and more important ones are the recently discovered oil deposits and natural gas in the eastern part of the country.

Nigeria is also developing its power potentials by constructing the Kainji dam on the Niger river.

It seems that fish production from fresh water is further expected if it is developed. However, the marine fish production is not so sufficient as expected in spite of the long coastline.

1.3 National Development Plan (1962 - 1968)

In the first three years (1962 - 64) of the Development Plan, the Government expenditure was concentrated on the training and education of the people.

In the following three years (1965 - 68), the Government expenditure will concentrate on the infrastructure and the production sector. An estimated expenditure of £700,000 which was budgeted in 1962 for researches and training concerning the fishery industry, was increased in 1965 to £2 million to include the realization of a fishing port in Lagos.

The realization of this project will be the first step towards the stabilization of the fish supply situation and will help to improve the dietary condition by increasing protein intakes of the population.

1.4 Fish consumption

Nigerian fish consumption is estimated at about 200,000 tons in fresh fish equivalent in recent years. (See chapter 4.)

It is generally recognized that the people of Negeria suffer from deficiency of protein in their diet. When compared with Ghana that consumed about 80,000 tons of fish in 1964, the per capita consumption in Nigeria is very low. It can be noted, however, that economical situations of both countries are different. In Ghana, for instance, the high national income enables the people to buy fish easily. The Government of Nigeria has been studying ways and means to increase fish production as a source of animal protein.

CHAPTER 2
PRESENT SITUATION OF FISHING AND FISH SUPPLY

2.1 General

The fishing and fish supplying in Nigeria may be broadly divided into two general groups as follows:-

1) Nigeria-based fishing
   a) Coastal trawling
   b) Pelagic trawling
   c) Indigenous canoe fishing
   d) Fishing in fresh waters
2) Other methods of fish supply
   a) Landing of frozen fish caught and carried by chartered foreign vessels
   b) Imported stock fish

2.2 Nigeria-based fishing

a) Coastal trawling

The coastal trawling is operated by about ten fishing boats with the gross tonnage ranging between around 10 to 50 tons. They are engaged in trawling off the Atlantic coast near Lagos Port where their catch is landed. At the time of the survey, the catch appeared to consist mainly of a kind of croaker, ray, shark, etc. It seems that operation of such fishing boats are often affiliated with foreign capitals and technique, and their efficiency is comparatively low. There is an indication that this type of fishing has been introduced in some degree into Port Harcourt.

b) Pelagic trawling

The pelagic trawling was commenced in 1965. At present three trawlers of 500 gross ton class are operating with Lagos Port as their base. Although this business is run by local capital, the operation is carried out with imported vessels manned by specialized crew assigned by foreign countries. The fishing ground lies off Angola which is far distant from and south of Lagos, and the leading item of the haul is a kind of croaker.

c) Indigenous canoe fishing

Regarding the coast of the country, the western coast faces the Atlantic Ocean in monotonous shoreline, parallel to which are a number of lagoons; the eastern coast, on the other hand, is a deltaic zone consisting of a network of rivers of all sizes, which furnishes good fishing banks for the indigenous canoe fishing. A considerable number of canoes having their bases in scattered fishing villages are engaged in this type of fishing. The fishing banks are made up of fresh water and brackish water. Bongas, cat fish, etc. represent the greater part of the catch by means of cast nets, gill nets, etc. They are consumed locally.

d) Fishing in fresh waters

Various data indicates that the fresh water fishing is conducted in Lake Chad and in numerous rivers and ponds. Upon completion of the Kainji dam, another source of fresh water fish will be added to the above.

The total domestic production of fish in the country is presumed to amount to 40,000 - 50,000 tons a year, although exact

statistics are unavailable.

2. 3 Other methods of fish supply

a) Landing of frozen fish caught and carried by chartered foreign vessels

The supply of frozen fish based on loose chartered agreement with foreign vessels was commenced in 1962 by the fishing vessels of Poland and Japan. At present, catch from Russian and Polish trawlers are transported either by the trawlers themselves or by other carriers to be landed chiefly at Lagos Port.

The principal items of such landed catch are a kind of horse mackerel, mackerel, croaker, etc. which are comparatively fresh and moderate in price. Since they constitute an important source of fish protein for the general public, they are an indispensable part of diet of the people.

The latest record of such landing represented a little more than 18, 000 tons in 1964.

b) Imported stock fish

This item is represented mainly by a kind of dried cod produced in Northern Europe, etc. In addition, there are some tinned fish, but they may be negligible in quantity. Imported stock fish, for the most part, seems to be sent to the hinterland and consumed in the districts too distant from the sea for the fresh fish to reach.

General trade policy of Nigeria seems to restrict import, except for indispensable items, and, judging from the trend of import in the past, an increase in import can not be expected in future.

When discussing the supply of fish, etc. based on various data available, the yearly import of stock fish expressed in terms of fresh

fish equivalent is presumed to amount to about 150,000 tons.

STATISTIC RECORD OF IMPORTED STOCK FISH

Year	Dried quantity in thousand tons
1958	33
1959	39
1960	40
1961	37
1962	40
1963	46
1964	39

2.4 Government policy for developing fishing

The proper authority reponsible for fishing is the Ministry of Agriculture and Natural Resources, under which the Federal Fisheries Service is in charge of general fisheries administration. In each regional government, a special office is concerned with fishing whose activities seem to lay stress on the research of resources.

The Federal Fisheries Service, which has been performing researches on coastal fishing is expected to enlarge its activities to the fresh water fishing in Lake Chad and rivers.

Its annual budget (ordinary) amounts to about £66,600, and its researches on marine products are performed by small-sized vessels.

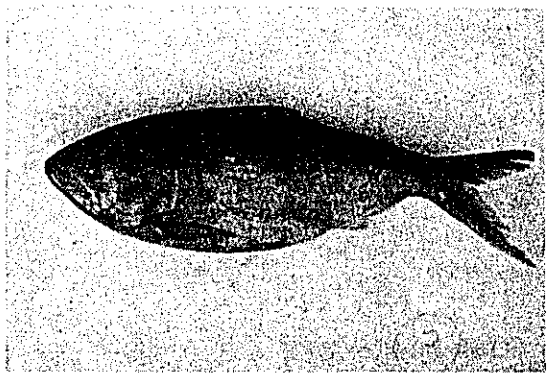
In the Six Year Plan (1962-1968) has been appropriated a fund of £2,122,000 for the development of fishery, out of this fund £2,000,000 are for the fishing port in Lagos, and the rest is for the development work of Lake Chad.

The Niger Delta Development Board, which has been established in

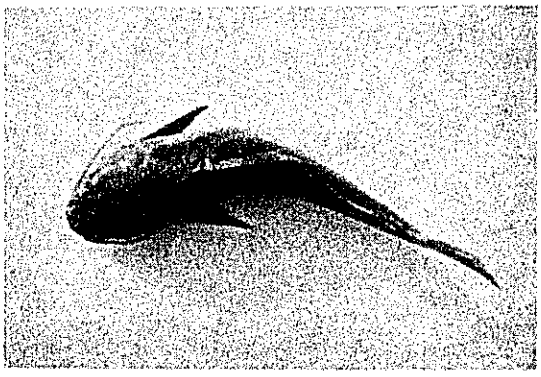
the Eastern Region, is concerned with researches on fishing (trawling) and experiments on pisciculture, while in the Western Region, researches on fishing (trawling) by small boats is being planned. Incidentally, FAO is engaged in research works on fish resources in the Gulf of Guinea including the Nigerian coast, the result of which will be made public in the near future.

Commercial fish

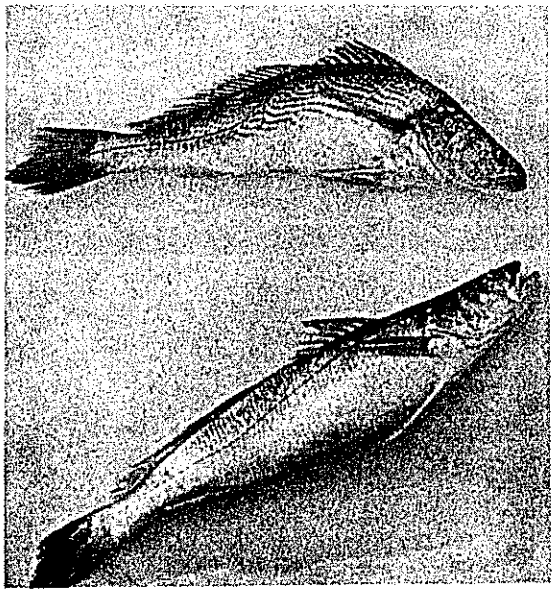
Some kinds of fish caught along the coastal area of Nigeria



Bonga, one of the important kinds of fish caught in canoe fishery



Cat fish, an important object of both coastal and fresh water fishing



Croaker, an important fish for the nation

CHAPTER 3
FISH DISTRIBUTION

3.1. Market

There are three densely populated zones in Nigeria. One is Lagos and its hinterland in the west, the second is Port Harcourt and its hinterland in the east and the third is Kano and its surrounding in the north. Those three zones are located far apart from each other, the distance between their respective distribution centers is more or less 600 miles. The population of Lagos and its hinterland is estimated at about 13 million people which is roughly one fourth of the total population of Nigeria.

3.2. Landing of fish

The fish landed is broadly divided into the following groups.

1) Fresh fish ----------	Catch by canoes Fresh-water fish from rivers, etc. Catch by the coastal trawling
2) Frozen fish ----------	Catch by the loose chartered foreign vessel Catch by the pelagic trawling

Fish caught by canoes does not represent a small portion of the whole catch and some of the catch goes to home consumption with the remaining landed at villages or conveniently located landing places to be sold directly to middlemen.

In the case of coastal trawlers, the fish is landed at private distributing centers run by the owner of the trawlers.

The landing of frozen fish from loose chartered foreign vessels is limited to the two commercial ports, Lagos and Port Harcourt, because of the size of the vessels. In Lagos, there are two landing points; one is the Coal Wharf near the thermal power plant at Ijora and the other is the quay for fishing at

Apapa. The frozen fish is delivered to the fishing enterprisers with cold stores.

3.3. Sales

The way of selling fresh fish is different from that of the frozen fish. The former are sold at the landing spot to the middlemen. The sale of fish is done by kind and size, and small fishes are sold by number. As for the price it is fixed at the first by the seller (producer), then the buyers enter into negotiations.

The frozen fish is sold in small quantity every early morning by sellers who estimate the demand of each day.

The ordinary buyers carry the fish by taxi to the distant markets as far as they can carry the fish before sunrise. The merchandises carried by taxi are sold to the secondary buyers. The sellers carry the frozen fish by their own cold vans and store them again in small cold stores in the hinterland.

3.4. Middlemen

The ordinary buyers are generally women called market-mammies. It seems that some of them have comparatively large funds, buy the fish in relatively large quantity and sell them to other mammies in small quantity. Those buyers who have cold vans are enterprisers.

3.5. Cold storage facilities

The frozen fish are stored in cold stores. The capacity of the cold stores in Lagos and its vicinity is said to be 6,000 tons in total and in addition to them some are located in the cities in the Western, Mid-western and Eastern Regions, totalling about 3,000 tons.

It is said the first cold store was installed in 1962. Since 1964 a remakable increase of cold stores in number has been seen not only in big cities, but also in local towns. (Figure 3-1 & 3-2)

3. 6. Condition of retail sales

It is one of the characteristics of any city, town or village that the retail sale of daily necessities and supplies is concentrated in a market and each store in the market is very small. The fish are sold there by piece or by lot, which inevitably renders them less fresh.

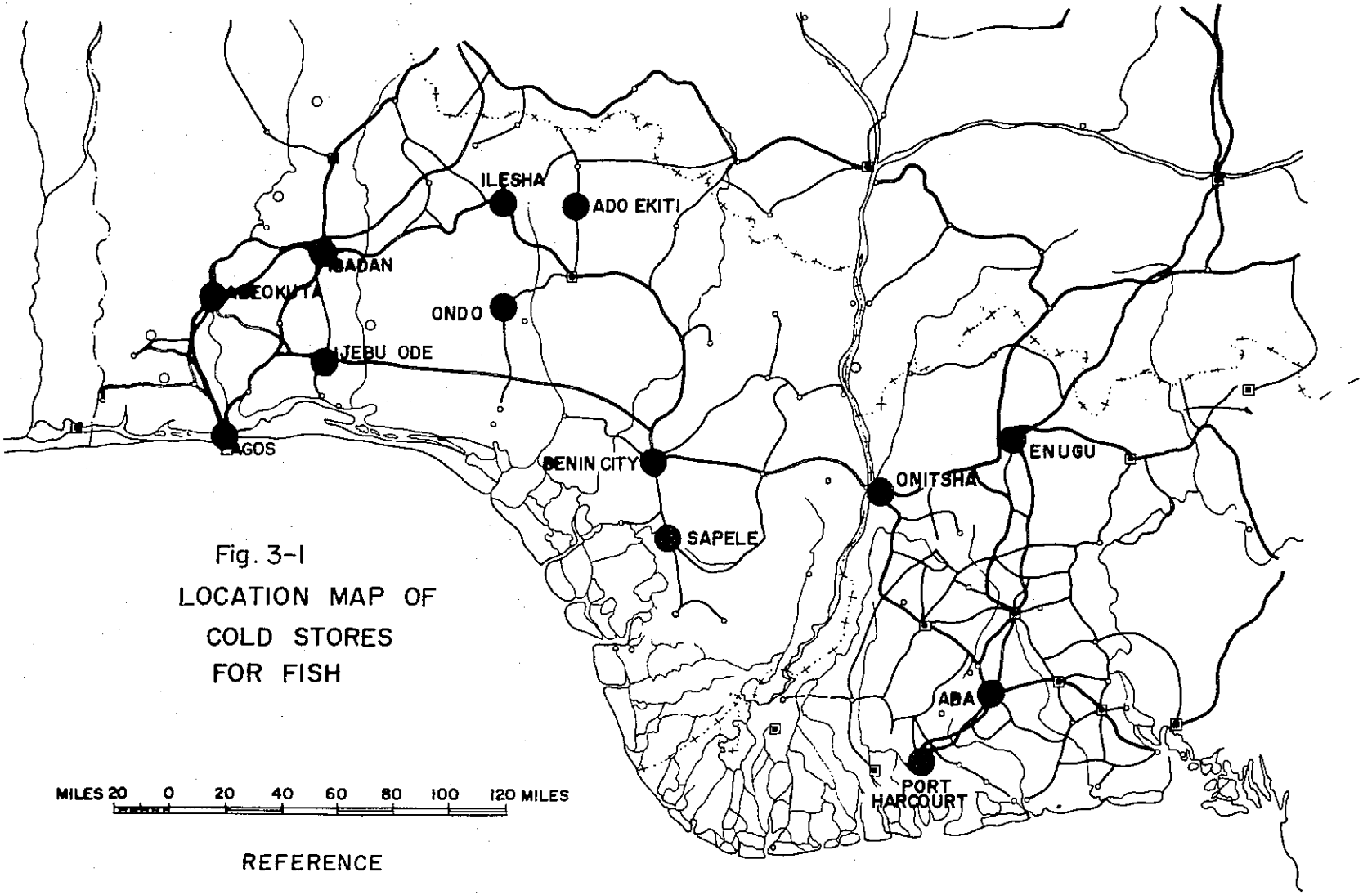
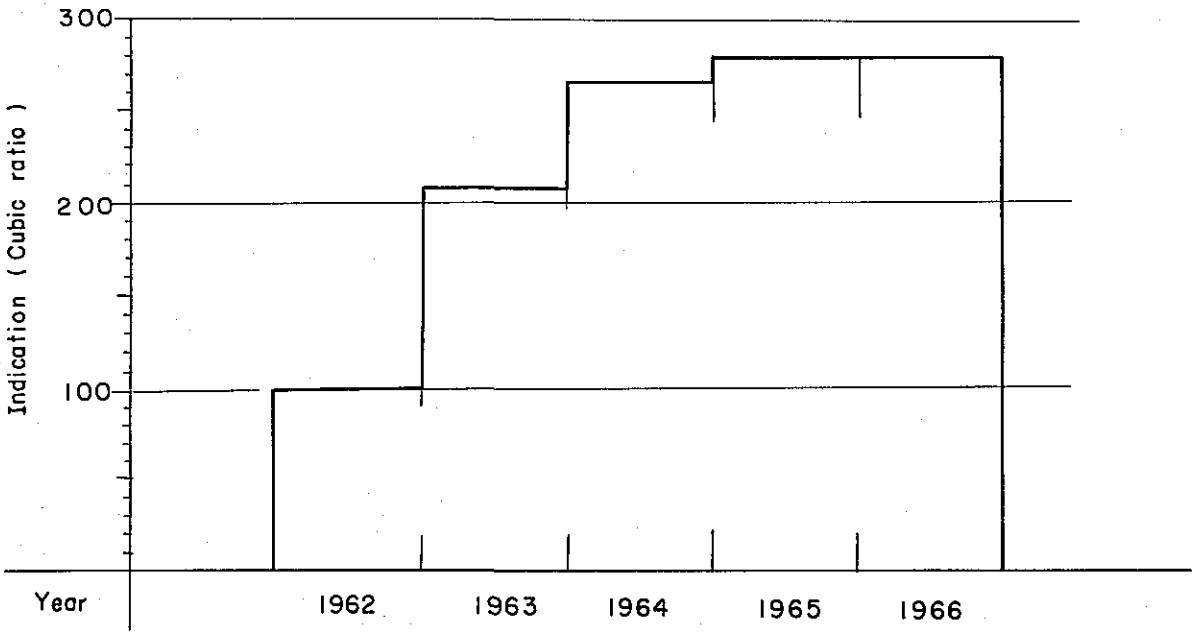


Fig. 3-1
LOCATION MAP OF
COLD STORES
FOR FISH

Fig. 3-2

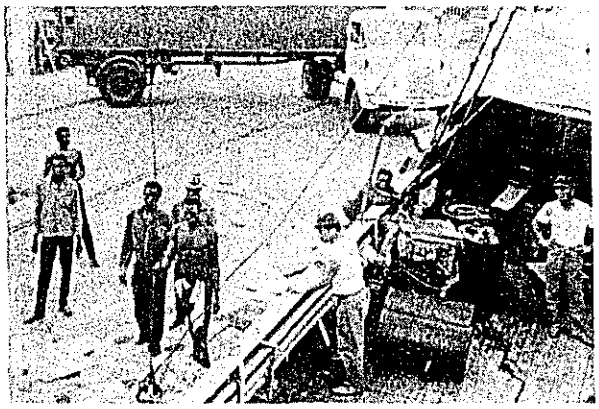
TRANSITION OF INSTALLED COLD STORAGE FACILITIES

(Mainly for fish)



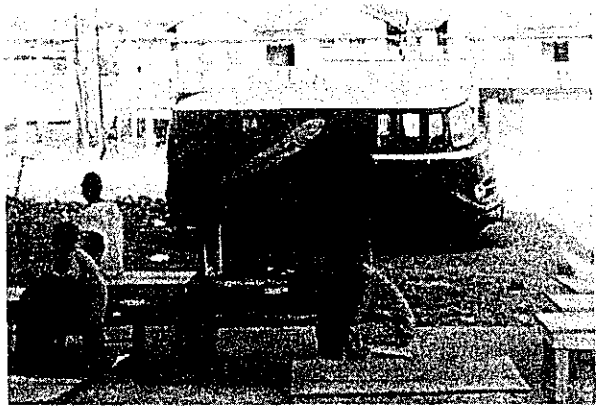
Note: The year of 1962 indicate 100 as a basic figure and the successive year fluctuate on the said indication.

Distribution(1)



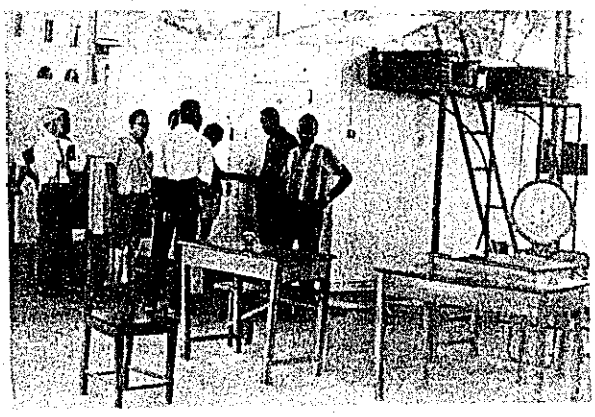
Landing of frozen fish at the fisheries wharf, Apapa

Frozen fish being transported from landed port to hinterland



Advertisement of fish painted on car

Small cold storage in a hinterland city



Disribution(2)

Dried fish at a local market

Dried fish sold at a local market

Dried fish at a local market

CHAPTER 4

BASIC CONSIDERATION FOR THE FISHING PORT PLANNING

4.1. Ultimate objective of the project

The mission understands that the construction of a fishing port in Lagos has been a long cherished desire of the government and it is included in the National Development Plan, and that the ultimate objective of this project lies in the stabilized supply of fish protein to the people at lower cost.

4.2. Necessity of the project

The existing port facilities for landing fish from loose charactered foreign vessels are inadequate and unsatisfactory to handle the landings efficiently and economically, and lacks the function as terminal that is the starting point of distribution of fish.

Such chartered foreign vessels with the load of frozen fish have been often kept at anchor due to congestion of ocean going vessels at the commercial port. This has economically bad effects on the frozen fish.

In the present situation fish are unloaded at the coal wharf or other wharf. Those wharfs lack in sufficient facilities for handling frozen fish.

While, the national demand for fish will increase with the economic growth due to materialization of the National Development Plan.

From such points of view, it is quite natural that the construction of fishing port is required by the government and a suitable fishing port mainly for frozen fish is planned in Lagos.

It would be advisable to plan the fishing port along the line which will be discussed in the following manner.

4.3. Scope of the project

It is most important to forecast such factors as the quantity of landings,

number and type of the vessels, etc. However, the data of the past and present in respect to the above items are insufficient, so that it is difficult and risky to make a decisive forecast of future situation. Keeping this in mind the forecast is assumed in the following paragraphs.

4.4. Estimate volume of frozen fish to be unloaded

Judging from the recent record of the frozen fish unloaded at Lagos Port, the landing of 20,000 tons may be presumed as the lower limit of the projected fishing port.

Regarding the total national demand for fish protein, it is difficult to forecast it, because the fundamental figures could not be found in the existing statistics.

As to the supply for the demand it may be presumed to be a little more than 200,000 tons (Fig. 4-1). If the figure of the supply is used as that of demand for the convenience of calculation of demand, the total amount of future demand might be assumed in consideration of growth rates of national economy (when long term plan has been materialized), income elasticity of demand for fish and others.

The total demand for fish in and around 1970 is assumed to be about 250,000 tons. The followings are considered in calculation of amount of supply in 1970.

1) The imported stock fish will not increase so much according to their past record of import (Fig. 4-2) and the Government import policy.

2) The coastal trawling is reasonably considered to remain unchanged for the time being.

3) Accordingly, the supplement of the supply deficit to the increment of demand will have to rely upon the following sources:

a) The catch of fish by canoes of which encouragement measures are materialized.

b) The frozen fish unloaded from the loose chartered foreign vessels.

The canoe catches can be distributed at any place of whole Nigeria where the canoes are working and the frozen fish will be distributed mainly through the port facilities of Lagos. It is, therefore, desirable that the frozen fish supply will be made by the loose chartered foreign vessels into Lagos in the annual amount of about 40,000 tons.

However, there is a limit in the supply. The limit can not be made clear due to uncertain factors, but it may lie along the level of the above-mentioned quantity.

Therefore, the upper limit of expected capacity of the fishing port will be about 40,000 tons of landings in and around 1970.

In this connection, it is advisable to avoid an over-investment in landing facilities, because the Mission afraids they might lie idle.

Fig. 4 -1

PRESUMED PERCENTAGE OF FISH SUPPLY IN 1965

(Fresh fish equivalent in weight)

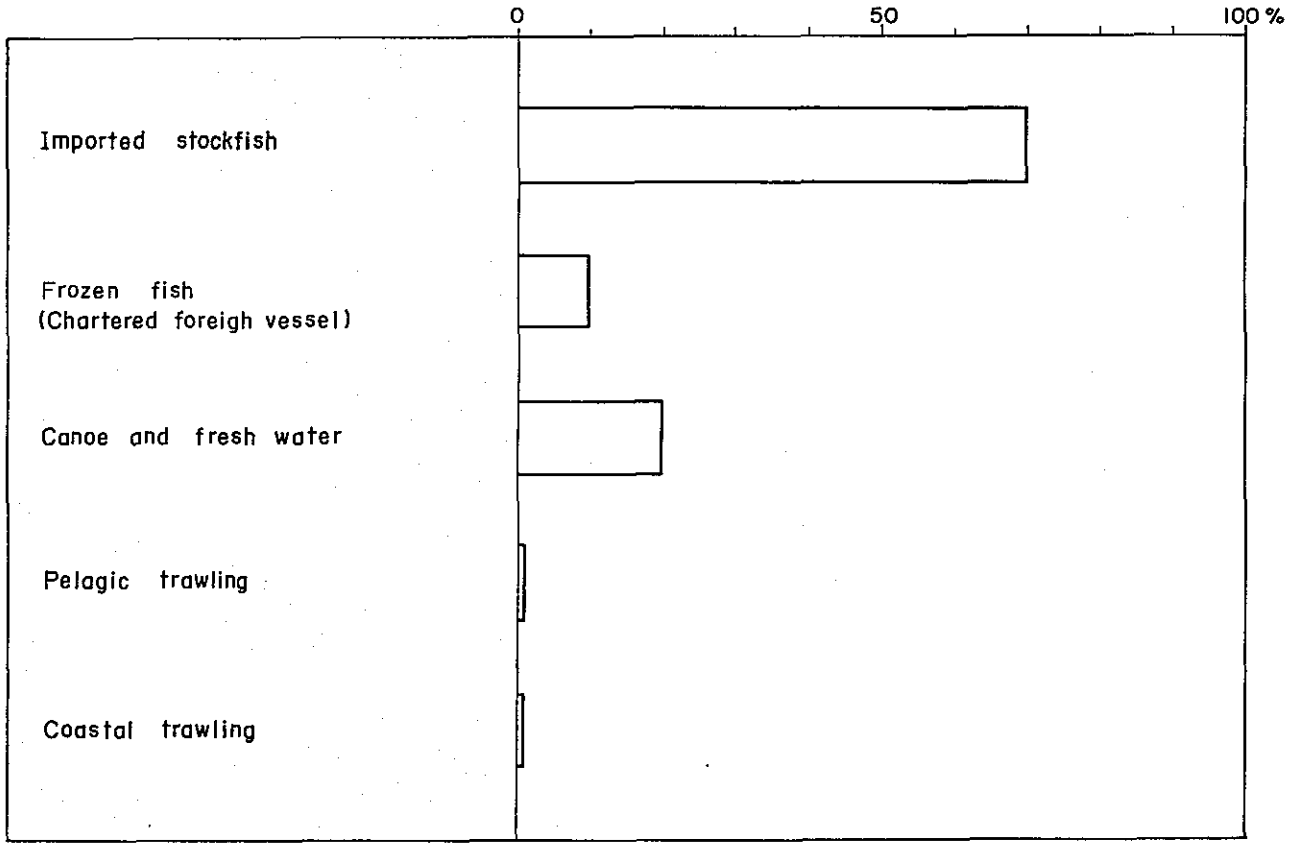
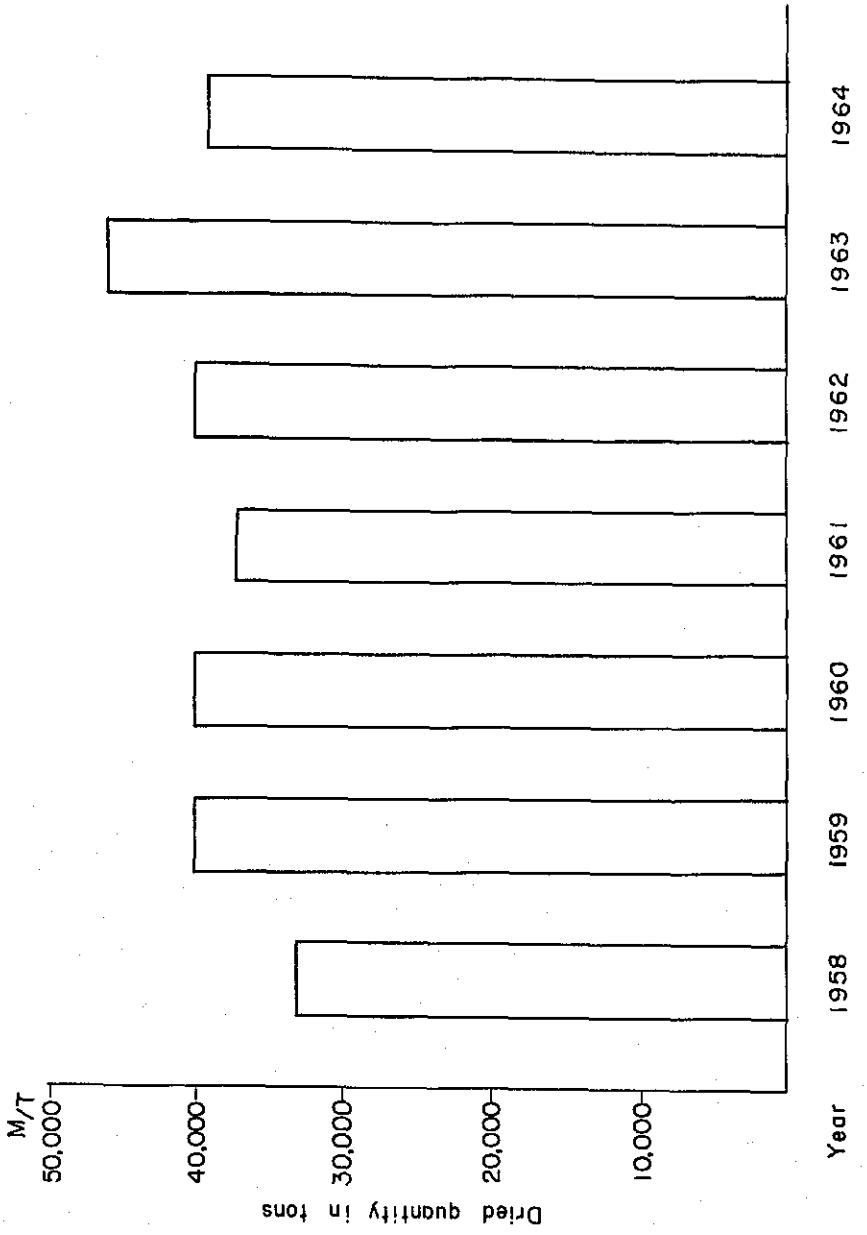
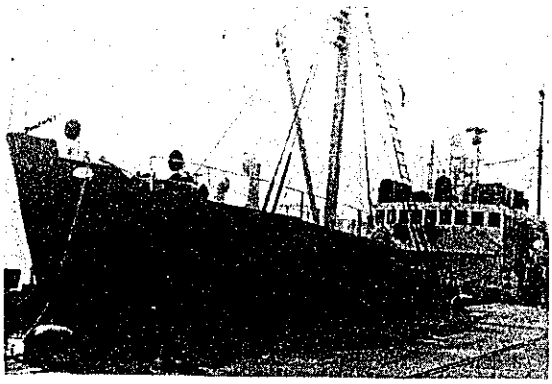


Fig. 4 -2

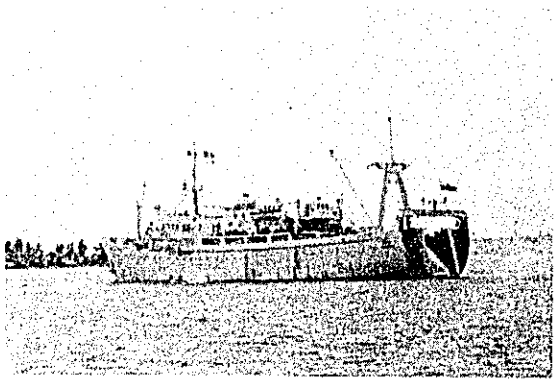
RECORD OF INPORTED STOCK FISH



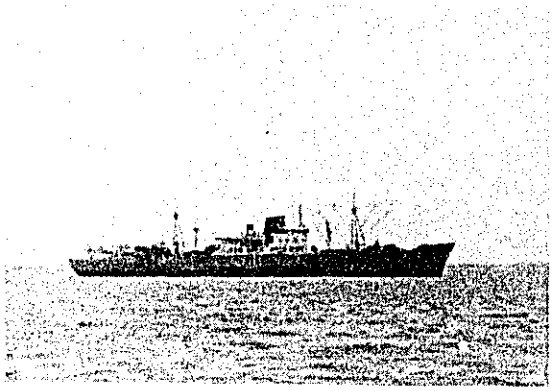
Fishing vessels



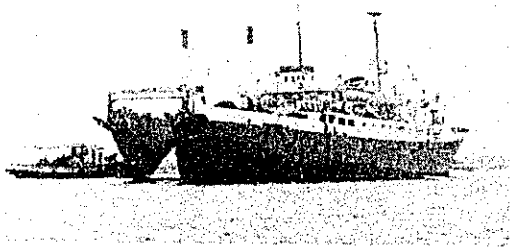
Pelagic trawl fishing vessel



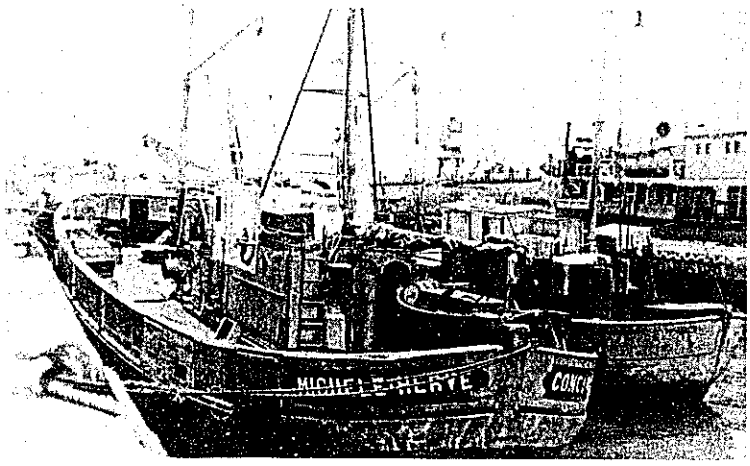
Loose chartered foreign fishing vessel



Loose chartered foreign vessel



Loose chartered foreign fishing vessel



Coastal fishing vessel

PART II
FISHING PORT PLANNING

PART II
FISHING PORT PLANNING

CHAPTER 1
GENERAL CONDITIONS
(Refer to Appendix 1)

1.1 Meteorology

Lagos is affected both by the land and sea breezes, with the southwest wind prevailing. The southwest winds appear most frequently in August and September. It is said that fierce wind seldom visits this area.

There are two seasons in Nigeria, rainy and dry. The rainy season is relatively short, from May to July, while the dry season lasts from August to April. The mean annual rainfall of the past 70 years is about 72 inches. It is said that the creek side has never inundated with water even in the rainy season.

The air temperature variation in Lagos is generally small through the year. The mean maximum temperature is about 86°F and minimum is about 75°F in a year.

The annual mean relative humidity in Lagos is about 83 %. It varies quite inconspicuously throughout the year.

1.2 Sea condition

It is said that the tide is almost constant through the year and there is no remarkable change, extraordinary tides nor tidal deviations.

The flood and ebb of the tide seems to cause considerable rapid current in the channel connecting the open sea with the Lagos Lagoon. Judging from eye-observations, the velocity of the current seems to be about 2 - 3 knots at maximum. Several shallow parts and shoals are found in the channel, but

siltage does not seem to be serious.

It was observed that the corrosion of steel materials is remarkable and damage to timber materials by marine borers is severe.

1.3 Geological conditions

According to the geological map of Nigeria, the area in and around Lagos is formed of alluvial deposit. The most part of alluvial deposits comprises clean sand but peat, organic soil or silty strata exist near the ground surface in some places.

There seems to have no history of earthquake in Negeria. Accordingly, no seismic force is taken into account for the structure design.

1.4 City planning

The Lagos Executive Development Board is contemplating the repartition of Lagos into the following classification.

Administrative and commercial zone	Lagos Island
Residential zone	Ikoyi Island, Victoria Island, West part of Apapa, Ebute Metta, Suru Lere
Commercial port zone	East part of Apapa
Industrial zone	South of Apapa, Iganmu

1.5 Land traffic

Land traffic is in general heavy and congested, especially in the commercial and administrative area. The Apapa road used for the transport of cargo to and from the commercial port is often overcharged and the traffic flow comes often at a standstill. The Carter Bridge has the heaviest traffic in the city. To relieve the heavy traffic on the Carter Bridge, a new Mainland Bridge is now under construction.

Iddo Island is a key point of the land traffic in the Lagos city. The railway terminus is also located in this island.

1.6 Port

The Apapa commercial port has nine berths of quay walls, and four more berths are now under construction.

Each quay is equipped with wharf cranes; a port railway and water supply facilities are available at the quay. There are also a shipyard and repair shop for automobile and locomotive.

CHAPTER 2
SITE SELECTION

2.1 Conditions of site selection

An adequate site for the construction of a fishing port, must satisfy the following conditions.

1) Adequate land area;

2) Adequate water area;

3) Water side accessibility;

4) Land side accessibility;

5) Availability of public utilities;

6) Agreement with the usage, operation and future expansion of the commercial port;

7) Conformity to the city planning;

8) Space to facilitate future expansion;

9) Reasonable cost of construction and maintenance.

2.2 Alternative sites (See Fig. 2-2)

From the above-mentioned viewpoints, seven alternative sites considered by the Nigerian Authorities were investigated. They are:

Old Mailboat Jetty at Iddo

Ijora Coal Wharf

Extension of Ijora Industrial Area

Apapa Industrial Estate

Tin Can Island

South-West Corner of Apapa Wharf Extension

Badagri Creek Point

From its own views, the Mission studied about the possible sites, other than the above-mentioned, located in and around Lagos. They are:

South-West Corner of Iddo Island (Ijora Site)

North-West Side of Victoria Island

Outer Shore Side near the Harbour Entrance.

2.3 Site study

Study was made on the above sites on the basis of air reconnaissance, field investigations, the data and maps made available during the period of the survey. The following opinions are formed on the respective location.

1) Old Mailboat Jetty at Iddo

The existing Carter Bridge restricts the passage of fishing vessels. Therefore, this site is considered unsuitable.

2) Ijora Coal Wharf

The road condition is unsatisfactory and there is no sufficient land area. Additionally, it will become narrower when the Mainland Bridge is completed.

3) Ijora Industrial Area

Sufficient area is not available here. A submarine pipe line and underwater power cable exist at the entrance of the Ebute Metta Creek and they will not allow dredging necessary for the passage of large fishing vessels.

4) Apapa Industrial Area

Road condition and land area are insufficient at present, and the commercial port has the future expansion plan in this area.

5) Tin Can Island

It is possible here to get sufficient land area, water area and water frontage for the fishing port facilities by dredging and reclamation. It will be also possible to expand the port in future. Moreover, considerable land area could be reclaimed for industrial or residential use in the neighborhood.

The weakest point of this site is the fact that the water side accessi-

bility is inadequate and more expenses are likely to be involved in dredging channel of about 16,000 feet long with both high initial and maintenance costs.

Furthermore, it will be much inconvenient for large size vessels to pass through such a long and winding channel. To get land side accessibility, a causeway of about 500 feet long should be constructed to connect the island with Apapa. It is feared that the busy Apapa road, unless improved, will be clogged by the added traffic from the Tin Can Island.

6) South-West Corner of Apapa Wharf

It can not be recommended to construct a fishing port at this site because the fishing port would be located in the commercial port.

Commercial port and fishing port should be separated because the cargo handled respectively by these ports are different in nature.

7) Badagri Creek Point

Here, the water side accessibility is more suitable, land area could be increased by reclamation works and there are spaces for future expansion.

The weakest point lies in its poor land side accessibility and lack of public utilities.

8) South-West Corner of Iddo Island (Ijora Site)

It will be possible to get an adequate land area by reclaiming the shoals along south coast and a suitable water area with a little dredging of the channel and the harbour basin. This site would be most adequately located for the distribution of fish to the major consuming areas.

An approach road connected with the Ijora causeway will be easily constructed on the west side of the reclaimed land. When the road now under planning will be connected with the Lagos Island and the mainland through the Iddo Island, road condition becomes more convenient.

From the viewpoint of the water side accessibility, it is considered that the sailing of fishing vessels, especially of small fishing boats, through the front of the Apapa Wharf, might interfere with the traffic of commercial vessels.

The construction cost of a fishing port at this site will be comparatively low although it cannot be definitely estimated now because of the need of further studies to ascertain the existence of shale rock strata at the bottom of the water.

More studies and hydraulic experiments will have to be carried out to make an accurate estimation of the expenses. In spite of that, the maintenance cost of the channel and the harbour basin is not expected to be very expensive.

9) Victoria Island

This site has suitable water side accessibility and sufficient water frontage. It seems to be comparatively easy to get the necessary land area by reclamation.

As to the land side accessibility, the vans to and from the fishing port will have to pass through the administrative and commercial zone of the Lagos Island, and also to cross the Carter Bridge where the flow of traffic is very heavy.

Moreover, as the Victoria Island is considered in the city panning as a high class residential area.

It might not be wise to select this site for the fishing port.

10) Outer Shore Side near the Harbour Entrance

High cost would be required for constructing new breakwaters facing the open sea. In addition, judging from our eye-observation, there seems to be notable sand drift on the shore and the maintenance of port entrance

would likely be difficult.

2.4 Proposed sites for the fishing port

As the result of the comparative studies made on the above-mentioned sites, two alternative points are proposed, namely;

the Ijora site

the Tin Can Island site

The eventuality of selecting the Badagri Point as a third alternative has been considered but it was dropped because there is no access road at the present moment. If an access road is to be constructed, it would require the construction of bridges and causeways.

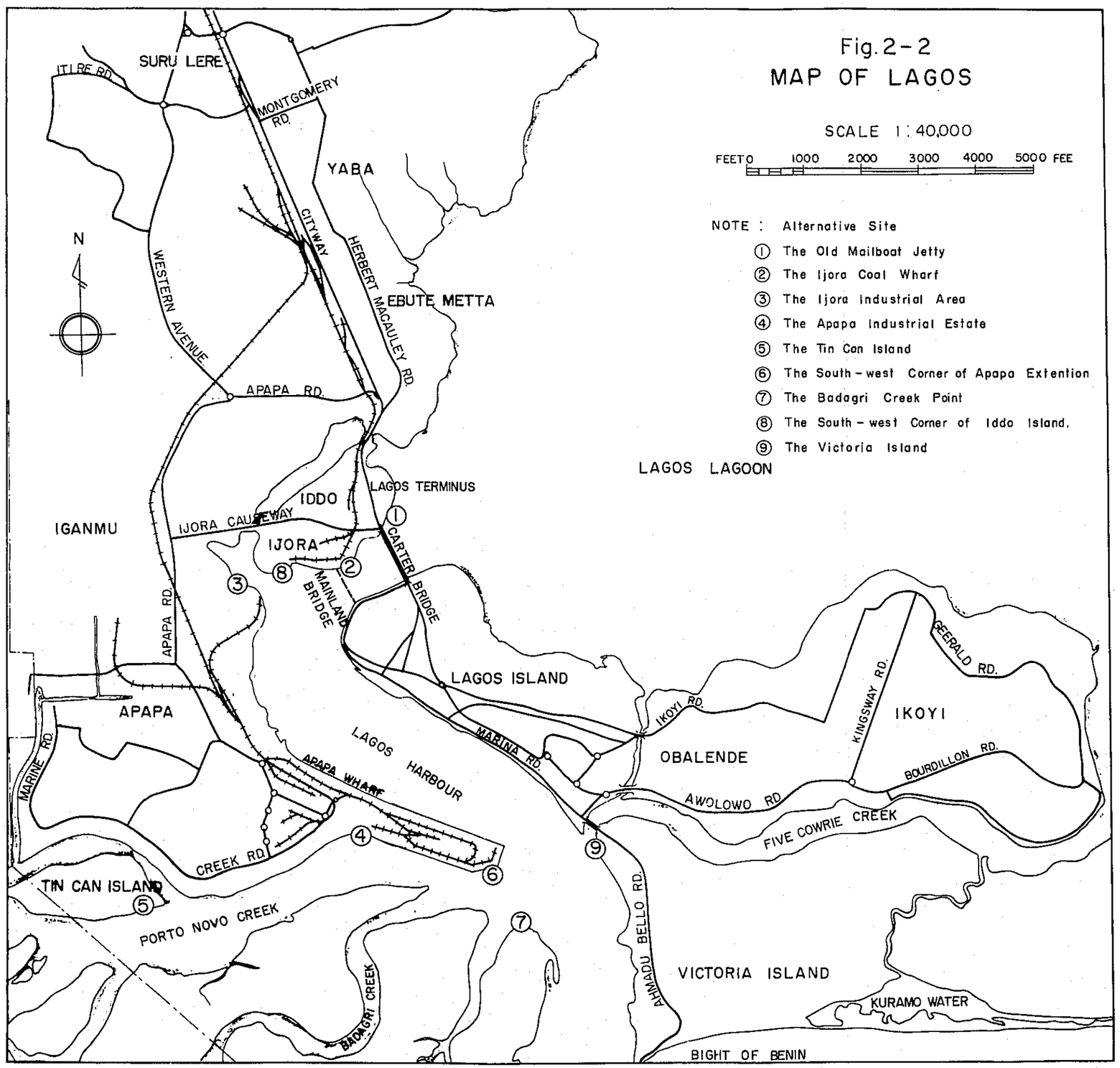
Fig. 2-2
MAP OF LAGOS

SCALE 1 : 40,000

FEET 0 1000 2000 3000 4000 5000 FEE

NOTE : Alternative Site

① The Old Mailboat Jetty
② The Ijora Coal Wharf
③ The Ijora Industrial Area
④ The Apapa Industrial Estate
⑤ The Tin Can Island
⑥ The South - west Corner of Apapa Extention
⑦ The Badagri Creek Point
⑧ The South - west Corner of Iddo Island.
⑨ The Victoria Island



CHAPTER 3
FISHING PORT PLANNING

3.1 Basic consideration

The principal aim of the fishing port construction is to provide the people with fish as much as possible in view of levelling up the people's nutrition.

Under such circumstances, it is desirable that this port have such functions as efficient landing of fish caught by pelagic or inshore fishing, installing the adequate facilities for handling, packing, storing or distributing the fish, and also to give facility for supplying the necessities to the Lagos based fishing vessels.

The demand for fish will, of course, increase in Nigeria. It is difficult, however, to forecast whether or not the increasing demand may be met with sufficient supply, as it was explained in Part I.

The scale or size of a fishing port is to be based on the prospect of future fish supply and will differ in different prospect.

In a private enterprise the planning of investment is usually based on an average or moderate estimate of future demand and supply.

In case of a fishing port, however, it is a public facility for the sake of the whole nation. Therefore, the plan of a fishing port should be made on a somewhat larger scale so that the people may not suffer a loss when the actual need unexpectedly exceeds the forecast.

From such points of view the forecast of the landings is made in the following section. The estimated forecast, however, will not be guaranteed by any persons; it will be attained by the government's proper and efficient measures.

3.2 Planning target

Generally speaking, the fishing port facilities can not be constructed in

a short time when required, as it takes time both to raise up the fund and to construct it. After constructed, it must be used for a long time and its removal and reconstruction are not so easy. Therefore, on planning of a fishing port, it is necessary to make a long forecast as far as possible. And the actual construction will be carried out stage by stage economically.

In the planning of the Lagos fishing port, the first stage construction is considered necessary to make of the facilities which is assumed to be required after 5 years under the 10 years' forecast.

1) The forecast of landings in 1970

Judging from the number and size of the incoming fishing-vessels, the quantity of landings and other data available at hand, the fishing port capacity in 1970 may be acceptable if it satisfy such components as shown in the following table.

Table 3-2.1 ESTIMATE OF LANDINGS IN 1970

Items \ Type of vessel	3,000-1,500 G/T class /1	500 G/T class	Small vessel	Vessel without motive power
Presumed number of vessels	Unknown	3	about 10	about 760 (canoes)
Voyage time of a vessels a year	6 - 10 times	about 6 times	-	-
Total voyage times a year	about 80	about 18	-	-
Presumed average landing quality per voyage	about 500 tons	about 160 tons	-	-
Presumed landing quantity a year	about 40,000 tons	about 2,800 tons	about 2,000 - 3,000 tons (uncertainly)	Several hundred tons
Presumed average landing pace	200 ton/day	100 - 150 ton/day	-	-
Presumed average mooring period	about 5 days	about 2 days	-	-
Landing fish	frozen fish	frozen fish	fresh fish	fresh fish

Remarks: /1 The fishing boats or freighters of Soviet Union, Poland, Japan, etc. now are entering into Lagos.

2) The presumption of landings in 1975

The future prospect of the fishing vessels less than 500 G/T is very difficult. Therefore, to the increase of the demand for fish protein, it may be safe to make a plan of extention of the facilities for 3,000 - 1,500 G/T fishing vessels on assumption that the less 500 G/T fishing vessels will maintain the present situation for the near future. This wharf for 3,000 - 1,500 G/T vessels

may be used for less 500 G/T vessels, if required.

Table 3-2.2 PRESUMPTION OF LANDINGS IN AND AROUND 1975

Item \ Type of vessel	3,000 - 1,500 G/T class	500 G/T class
Presumed number of vessels	unknown	3
Voyage time of a vessel a year	6 - 10 times	about 6 times
Total voyage times a year	about 140 times	about 18 times
Presumed average landing quantity per voyage	about 500 tons	about 160 tons
Presumed landing quantity a year	about 70,000 tons	about 2,800 tons
Presumed average landing pace	200 tons/day	100 - 150 tons/day
Presumed average mooring period	about 5 days	about 2 days
Landing fish	frozen fish	frozen fish

3.3 Fishing vessels to be served

In view of the present condition, it is considered adequate that the following kinds of fishing vessels have been taken into account for the planning of the proposed fishing port.

1) Loose chartered foreign vessels

a) 3,000 G/T class

Length:	Approx.	260-290 ft.
Breadth:	"	50-55 ft.
Draft:	"	20-23 ft.

b) 1,000-1,500 G/T class	Length:	Approx.	230-250 ft.
	Breadth:	"	36-45 ft.
	Draft:	"	18-20 ft.

2) Lagos based vessels

a) 500 G/T class	Length:	Approx.	170 ft.
(3 units existing)	Draft:	"	15-16 ft.
b) 50-60 G/T class	Length:	"	90-100 ft.
(2 units existing)	Draft:	"	12 ft.
c) 20-25 G/T class	Length:	"	67-70 ft.
(4 units existing)	Draft:	"	10 ft.
d) 10 G/T class	Length:	"	60 ft.
(2 units existing)	Draft:	"	5 ft.

3.4 Quay (Refer to Appendix 2)

Generally speaking, in the planning of a quay, two factors are to be taken into consideration. One is the provision to offer as much convenience as possible for the vessels to enter the port and the other is the avoidance of over-investment in facilities. In other words, it is reasonable that the planning is so made that the total of construction, maintenance, operation costs and the cost or loss cause upon vessels waiting for berth would be kept at the minimum.

In the case of the proposed fishing port, the non-utilization of the quay represents a loss for Nigeria, but the loss incurred upon the vessels waiting for the berth is borne by the vessel owners. Because foreign vessels are involved, in the calculation of the cost factors to be considered in the planning of the quay, it is not adequate to deal with the former loss as of the same nature as the latter. Nevertheless, if for economical reasons, the number of berths is reduced, resulting in longer and more frequent periods of waiting for

the moorage, this will decrease the number of foreign vessels calling at the port.

For this reason, in order to keep the probability of berth-waiting at a reasonable level, a study was made, on the basis of the theory of queues, of various cases of waiting time and number of waiting vessels, and the adequate number of berths to be constructed at the fishing port was worked out as shown in the following table.

Table 3-4.3 PROPOSED NUMBER OF BERTHS

Classification of berth	First stage	Future extension	Remarks
Berth length 300 ft. Water depth 25 ft.	2 berths	5 berths	For 3,000-1,500 G/T class vessels
Berth length 200 ft. Water depth 18 ft	2 berths	2 berths	For 500 G/T class vessels
Berth length 100 ft. Water depth 18 ft.	4 berths	4 berths	For vessels below 50 G/T class
Bulkhead	Appropriate length	Appropriate length	For canoes

3.5 Channel and harbour basin

The main approach channel is to be envisaged to enable the passage of vessels with the maximum capacity of 3,000 G/T.

For this purpose the channel is desirable to be dredged to an effective width of 500 feet and a depth of 25 feet in chart datum. However, for the first phase of the project, an effective width of 300 feet of the channel will be usable.

The harbour basin is to be dredged to three depths i.e. 25 feet, 18 feet and 15 feet for the size of vessels. The basin is also to have sufficient space for the turning of vessels.

3.6 Land facilities

Suitable land facilities are to be envisaged for the efficient operation of a fishing port. In the Lagos fishing port the following facilities are considered.

1) Cold storage

Cold storage facilities are to be provided behind the quay where frozen catches are landed. Near by the cold storage, it will be necessary to provide enough space for the handling of fish, selling, despatching and also as a stockyard and parking. A suitable space with a width of about 220 feet may be sufficient.

It is advisable that the cold storage facilities are constructed by private investments.

2) Fish shed

Two fish sheds of about 20,000 square feet in total (50' x 200' x 2 Nos.) are to be constructed at proximity of the midium and small size quays to handle parts of the fresh fish that will be landed there.

3) Water, oil and power supply

Water, oil and power supply facilities are to be provided as the basic facilities at the proposed port.

The oil depositary is to be located at the safe place as to prevent any damage to other installations in case of accidents.

4) Administrative office

The Lagos fishing port is called to become the main fishing port of Nigeria.

From above viewpoint, this port will include the necessary administrative organs to handle efficiently all official business related to the fishing industry. It will be desirable that an adequate building is constructed to house the services of the Nigerian Ports Authority, the Federal Fisheries Service, and

other services concerned with custom, trade, food sanitation, medical inspection, quarantine, plant epidemic prevention as well as the security (police and fire service), postal service, radio and telephone station.

If the Tin Can Island is selected as the fishing port site, the building had better to include the electric and water supply sub-stations.

5) Other facilities

Besides the basic facilities listed in the preceding paragraph, other facilities of a fishing port will include a shipyard, engine repair shop, outfitting stores, sailor house, hospital, employees residences, private offices, etc.

Furthermore, as means of beautifying the surrounding befitting the fishing port of Lagos, it will be taken into consideration to provide as many green zones as possible and at the same time, to establish amusement centres, general stores, car service facilities and others in order to provide the sailors with adequate means of recreation. Besides the above establishments, a control tower will be constructed to control the use of berths and to give direction to the vessels.

CHAPTER 4
THE IJORA SITE

As one of the alternative site for the fishing port, the construction of a fishing port at Ijora has been considered. As it has been explained at the bebinning, this site was not mentioned by the Nigerian Authority but it was proposed by the Mission during the period of investigations in Lagos.

4. 1 Geological conditions

Due to the fact that no actual survey on the geological conditions of this site was undertaken, the geological features were relied upon the assumption as described below.

It was assumed that the upper part of the sea bed is formed of silt or clay and below this layer the formation is made of sandy soil.

However, if shale rocks exist under the ground, it is considered that the construction method and cost would change considerably so that cases were considered in planning of the project.

One is being the case where the sea bed is formed of only sandy soil and the other case is where shale rock is found under the silt formation at a depth of 10 feet below the sea bed.

4. 2 Port planning (See attached drawings)

1) Quay wall

For the operational convenience of vessels arriving and leaving the port, five large berths will be planned at the south side of the reclaimed land. The berth length will be 300 feet and the depth at the mooring 25 feet. During the first phase implementation, only two berths will be constructed, and the other berths will be added later according to the future requirement.

Two medium size berths of 200 feet long with a depth of 18 feet will be

planned on the west side of the reclaimed land to avoid any interference with the sailing of vessels and to be protected against the current.

Four small berths of 100 feet long with a depth of 15 feet will be planned along the north side in the inner-most part to avoid interference with the movement of larger vessels and to be protected against the infludence of the tide current in the waterway and also against the influence of the flapping of waves caused by the larger vessels.

The bulkhead for the approach road along the Ebute Metta Creek connected with the existing road will be used for canoes.

A 150 feet long jetty will be constructed at the south-west corner of the reclaimed land to transform the tidal current flowing between the lagoon and the Lagos Harbour into a natural current. This jetty will also prevent the accumulation of sand in front of the medium quay.

2) Channel and harbour basin

The water area of the channel from the water frontage of the Apapa Wharf to the fishing wharf will be dredged to a width of 300 feet at a depth of 25 feet; the slope grade will be 1:3.

The harbour basin in front of the quay walls will be enlarged to a maximum width of 800 feet to provide a space required for the movement of vessels. The area in front of the medium and small quays will be dredged to the depths of the quay walls respectively.

A part of the dredged soil will be used in the reclamation works and the unsuitable soil will be carried and thrown away in front of the pumping station in the Victoria Island.

It is assumed that about 50 percent of the dredged soil would be usable. If shale rocks are found, they will be used for the reclamation works and the unsuitable soil will be transported away in the manner described above.

3) Reclamation works

About 40 acres of land will be filled and reclaimed from the sea at the south-west corner of the Iddo Island. The filling materials will come from the usable dredged soil and if necessary they will have to be found elsewhere. At this stage, it is envisaged to get the filling materials from a site near Badagri, although the borrow pit for reclamation will be decided finally after soil survey near the site.

The reclaimed land is envisaged to be used as follows:

Quay wall	70,000 sq. ft.
(Spare for handling and packing including)	
Cold storage and fish shed	320,000 sq. ft.
Roads	410,000 sq. ft.
Building site	270,000 sq. ft.
Correlated industrial area	310,000 sq. ft.
Green zones	200,000 sq. ft.
Others	50,000 sq. ft.
Total	1,630,000 sq. ft.

4) Roads

The main approach road is planned to connect the harbour with the Ijora causeway. It will be 80 feet wide with 68 feet for carriageway. The circular road around the reclaimed land will have a width of 50 feet with 36 feet for the carriageway and other roads will a 40 feet width.

4.3 Construction schedule

The construction of the port facilities including dredging the channel and the harbour basin will take about 22 or 24 months according to the condition of the sea bed. However, if the more quantities of shale rocks are found the more time would be required. In this period, is not included the period of mobiliza-

tion of equipments especially of the dredger. The period of construction may differ slightly according to the location of the borrow pits and spoil sites.

The major works of the first phase of the project are the dredging of the harbour basin and the channel, reclamation, construction of quays, roads and other facilities.

After the ground of the reclaimed land is properly settled, the construction of the needed facilities will be effectuated and at the same time, roads will be constructed.

Fig. 4-3 shows the construction schedule envisaged for two cases i.e. whether the sea bed is of shale rocks or not, for the Ijora fishing port.

Before commencement of the construction the detailed investigations and final design are to be completed.

4.4 Cost estimate

The construction cost is estimated roughly at £1,900,000 and £1,700,000 depending on whether shale rocks are found or not in the sea bed. Indemnification for removal of properties and acquisition of land is not included in the estimate.

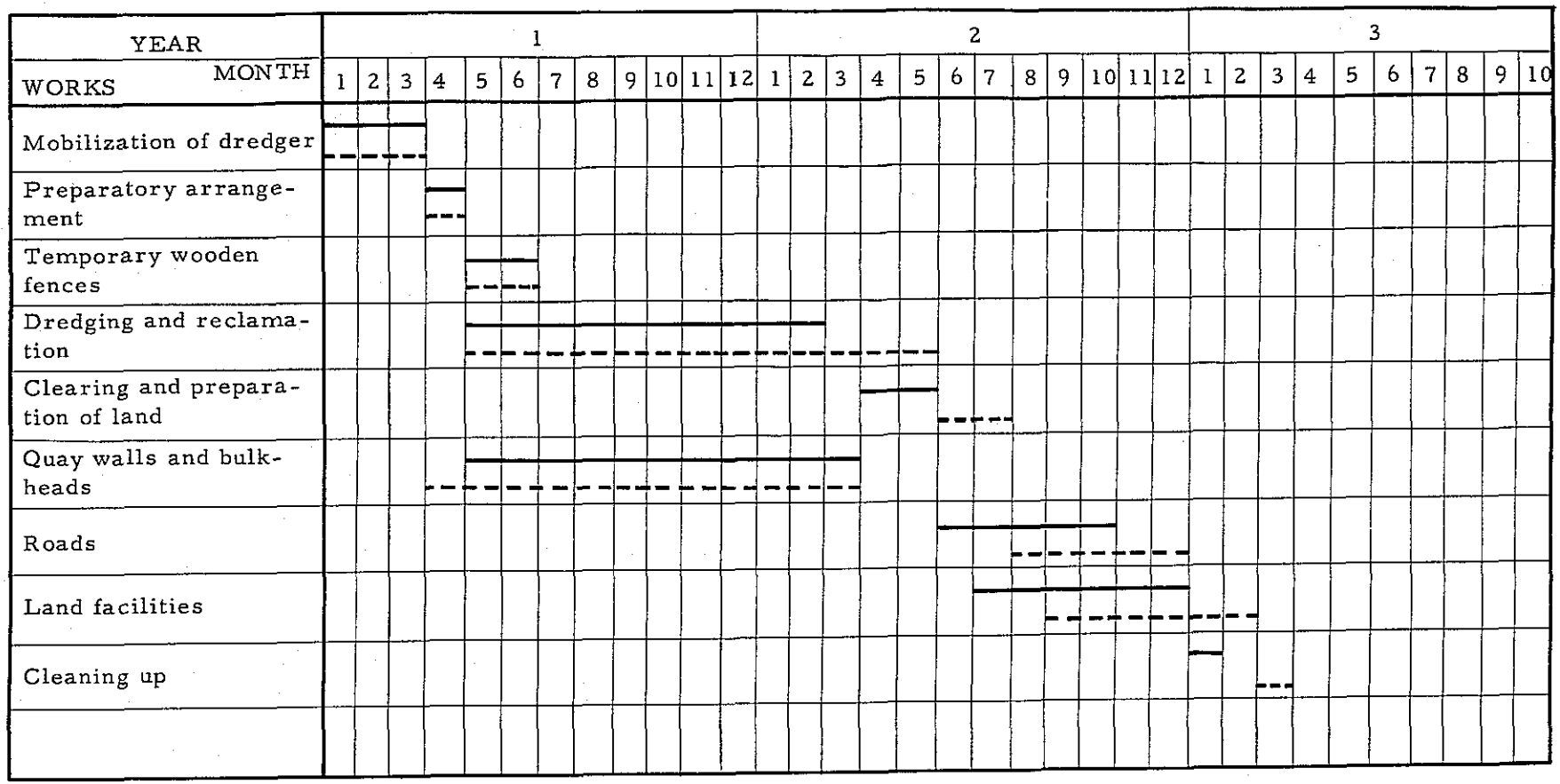
The breakdown of the estimated construction cost is shown in Table 4-4 below.

Table 4-4 BREAKDOWN OF CONSTRUCTION COST FOR THE IJORA FISHING PORT

(In case of existence of shale rocks)

Items		Cost (£)
1. Capita works		
Dredging of the channel and harbour basin		240,000
Reclamation and preparation of land		340,000
Quay walls and bulkheads		440,000
Roads		120,000
Water supply, oil supply and power supply installations		60,000
Office building and fish sheds		100,000
2. General expenses		
General expenses and engineering services		200,000
Contingency and reserve including interest during construction		400,000
Total		1,900,000
Breakdown:	L.C.	800,000
	F.E.C.	1,100,000

Fig. 4-3 CONSTRUCTION TIME SCHEDULE FOR IJORA SITE



Note: ——— When shale rocks do not exist.

– – – – When shale rocks exist.

CHAPTER 5
THE TIN CAN ISLAND

The Tin Can Island with an area of about 190 acres is situated in Porto-Novo Creek on the south side of Apapa. It is oval shaped and is not at present inhabited. The periphery of the island is surrounded by thick mangrove trees while the vegetation in the interior is formed by various trees covering the remaining portion of the island. This site has been considered as the proposed fishing port by the Nigerian Authorities.

5.1 Soil conditions

Soil conditions in and near the Tin Can Island had been surveyed by the Lagos Executive Development Board in 1964. The boreholes are indicated in Fig. 5-1.1 and the result of the borings are shown in Fig. 5-1.2 and 5-1.3.

During the period of survey, further investigations were made by the Mission with the cooperation of the Ministry of Works. The results of Dutch cone penetration and sieve analysis are shown in Fig. 5-1.4 and 5-1.5. Penetrometer probes were made and points indicated in Fig. 5-1.1.

Although further studies on soil conditions should be necessary for the detailed design, the planning of the fishing port on Tin Can Island was made on the basis of the available data and the results of the survey so far obtained.

5.2 Port planning (See attached drawings)

1) Quay wall

For the same reasons as explained in the case of the Ijora site, the large quays will be planned at the south side of the reclaimed land and medium and small quays will be arranged on the east side of the island.

As in the case of the Ijora site, the first phase planning of the Tin Can Island fishing port will include the construction of two large berths with

possibility of further extension to five berths.

Two medium-size berths with a length of 200 feet and a depth of 18 feet will be planned as well as smaller berths and bulkheads, the latter for the mooring of canoes.

The gravity type for the quay shall not be selected because the quay wall line shall be in the water and the consolidation settlement will take a long time, owing to the existence of peat.

2) Channel and harbour basin

A channel shall be dredged through the middle part of the Badagri Creek and beyond the Marina Shoals to connect the fishing port with the Commodore Channel at the Pool. The channel should be dredged to a width of 500 feet with a depth of 25 feet but for the first phase of the project a channel of 300 feet width seems sufficient.

The harbour basin will be at least 800 feet wide to provide enough area for the turning of vessels.

The dredged soil shall be used entirely as filling materials for the reclamation works. But the soils dredged from parts distant from the island shall be transported to the site located in front of the pumping station on the Victoria Island and deposited there.

3) Reclamation works

The filling works in the Tin Can Island imply large reclamation works according to the scale of the planning. With due consideration of the cost of the project, two cases are planned; one is the plan to reclaim about 70 acres of land located on the east side of the island near the harbour, and the other is to reclaim further area of about 90 acres as far as to the boundary with the Western Region.

4) Roads

No access road is available now.

A causeway linking the Apapa district to the Tin Can Island will have to be planned.

The causeway will be constructed by using the dredged soil as banking materials. The width of the causeway will be 100 feet with 10 feet edges on both sides.

The causeway will be connected with the main road which will have an 80 feet width and run in circuit around the island in future. The main road is connected with 50 feet wide roads which may be connected with smaller roads if required.

5.3. Construction schedule

The construction schedule for the Tin Can Island site will depend on the scale of the reclamation area that will be envisaged here.

In the case of the reclamation works are made only on the east part of the island, the period of works is expected to take about 20 months, but if the west part is also reclaimed, the works are expected to take about 24 months.

The major works of the project are the dredging of the channel and the harbour basin, land reclamation, construction of the quay walls and bulkhead, construction of the causeway and roads, and construction of port facilities.

The dredged soil will be used as filling materials for reclamation works and for the construction of the causeway that will connect the Tin Can Island to Apapa.

The construction of port facilities and other roads will be made after the ground has sufficiently settled.

In the construction schedule shown in Fig. 5-3, two cases have been con-

sidered. One is the case when the reclamation works are limited to the east part of the island only and the other case is the reclamation works will include the west part as well.

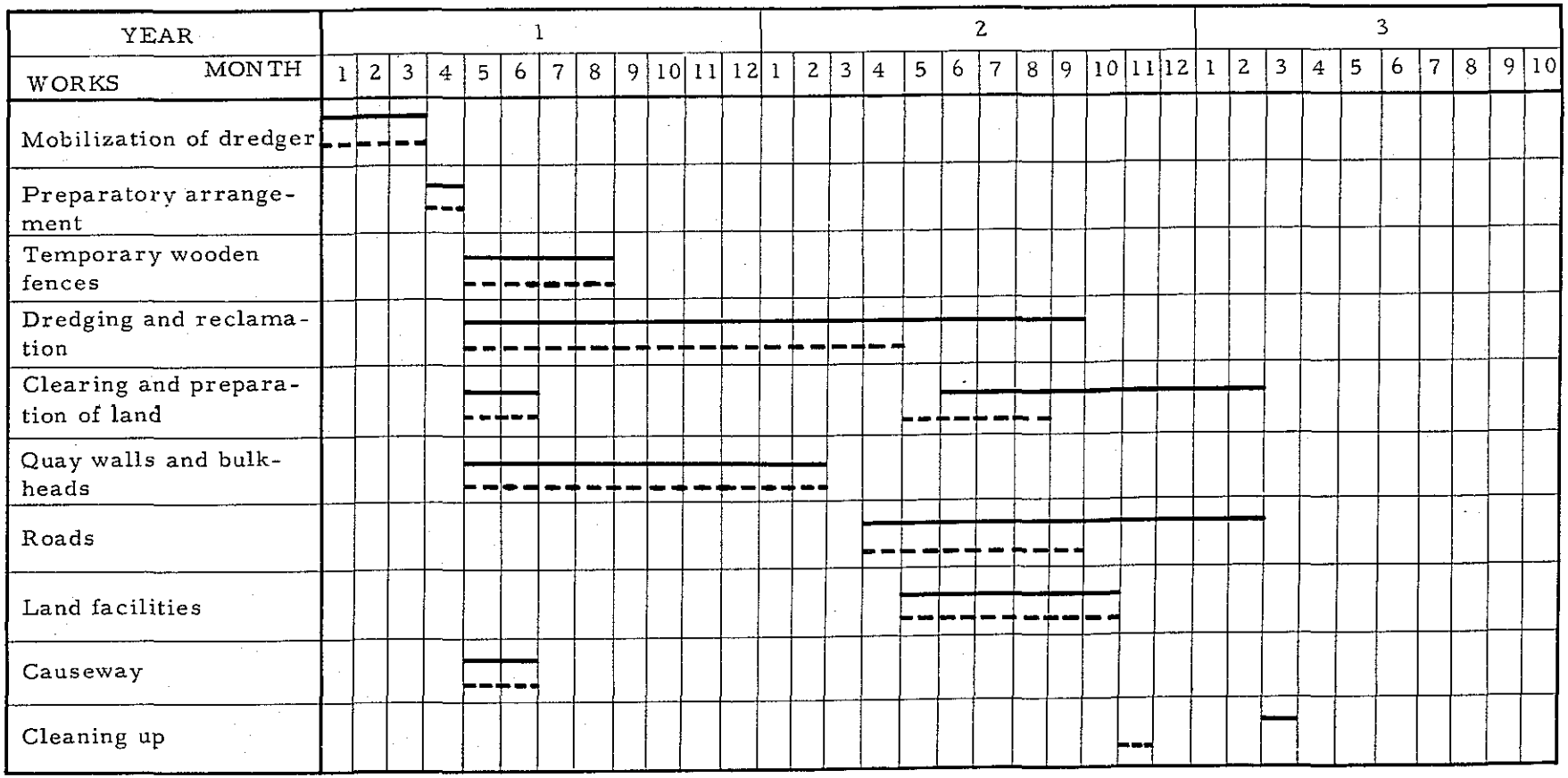
5.4 Cost estimate

In case reclamation works will be extended over the west side of the island, the cost is estimated roughly at £2,500,000 and if the east side is only reclaimed, the cost might be lowered to about £2,000,000. The biggest item involved the dredging of the channel. Indemnification for removal of properties and acquisition of land is not included in the estimate.

Table 5-4 BREAKDOWN OF CONSTRUCTION COST FOR THE TIN CAN ISLAND FISHING PORT

Items	Reclamation limited to east side Cost (£)	Reclamation including west side Cost (£)
1. Capital works		
Dredging of channel and harbour basin	560,000	560,000
Reclamation and preparation of land	30,000	260,000
Quay walls and bulkheads	360,000	360,000
Roads and causeway	220,000	400,000
Water supply, oil supply and power supply installations	60,000	60,000
Office building and fish sheds	100,000	100,000
2. General expenses		
General expenses and engineering services	250,000	250,000
Contingency and reserve including interest during construction	420,000	510,000
Total	2,000,000	2,500,000
Breakdown: L.C.	800,000	1,100,000
F.E.C.	1,200,000	1,400,000

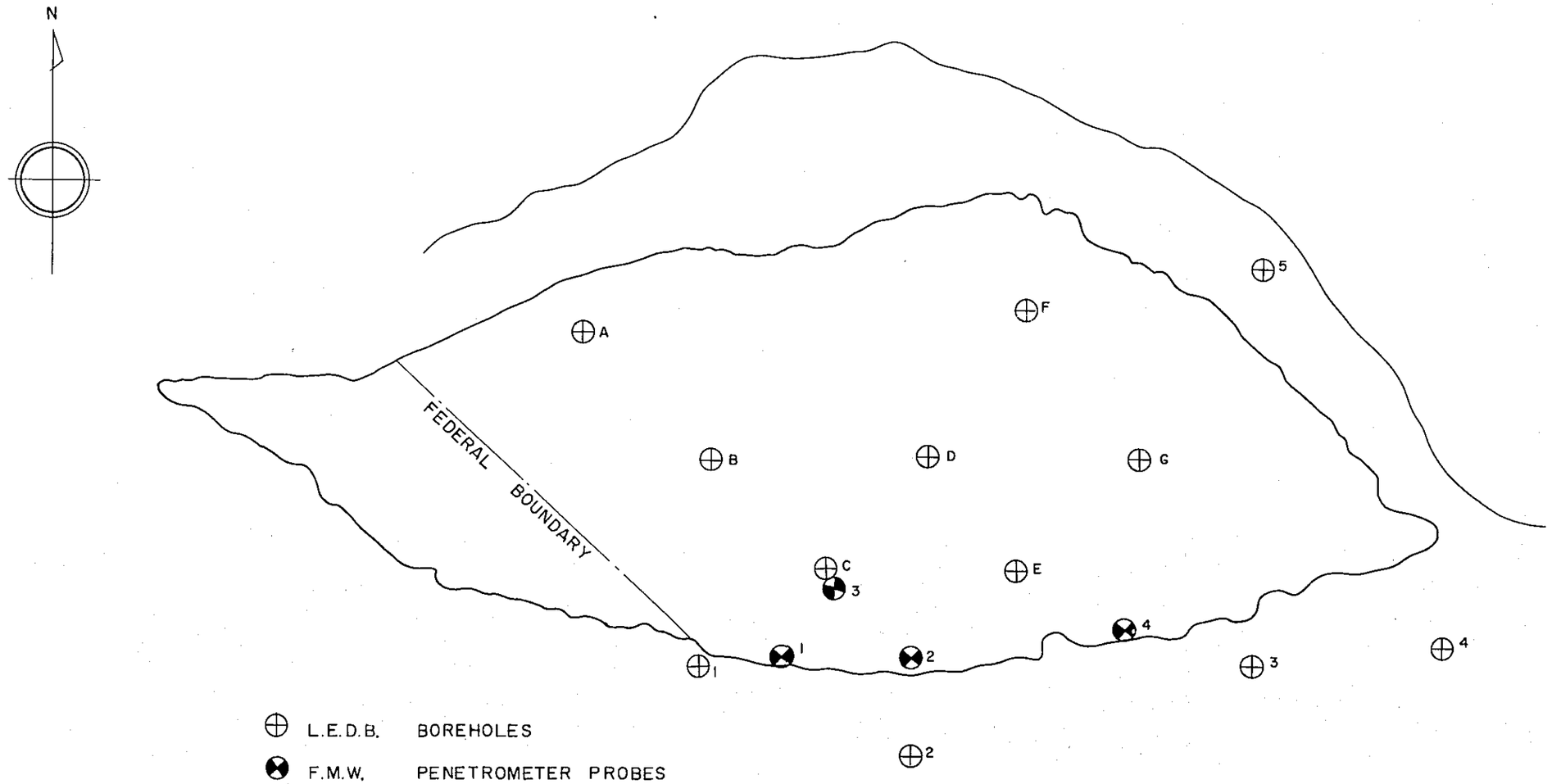
Fig. 5-3 CONSTRUCTION TIME SCHEDULE FOR TIN CAN ISLAND



Note: ——— West side included.

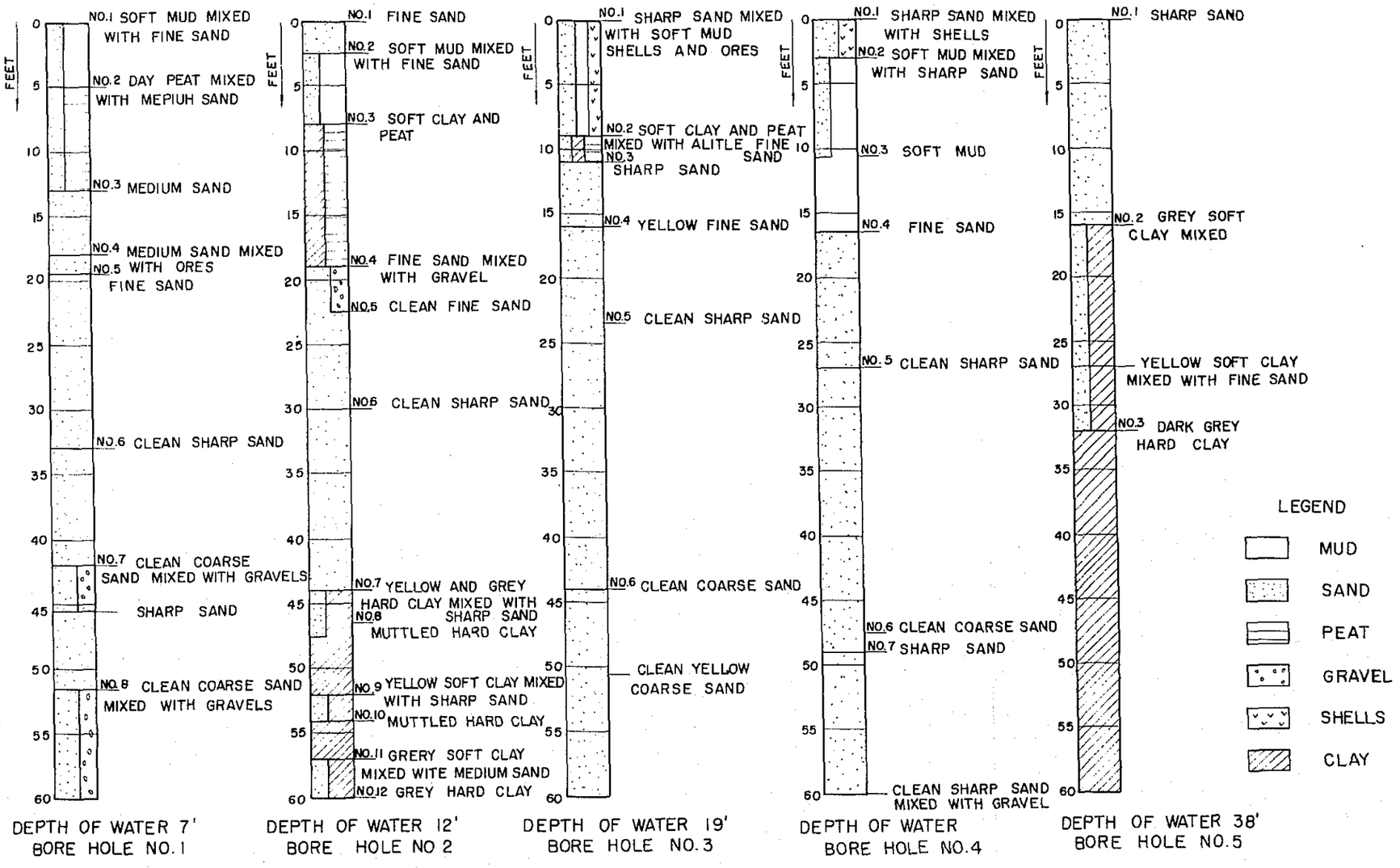
– – – – Only east side.

Fig. 5 - 1.1



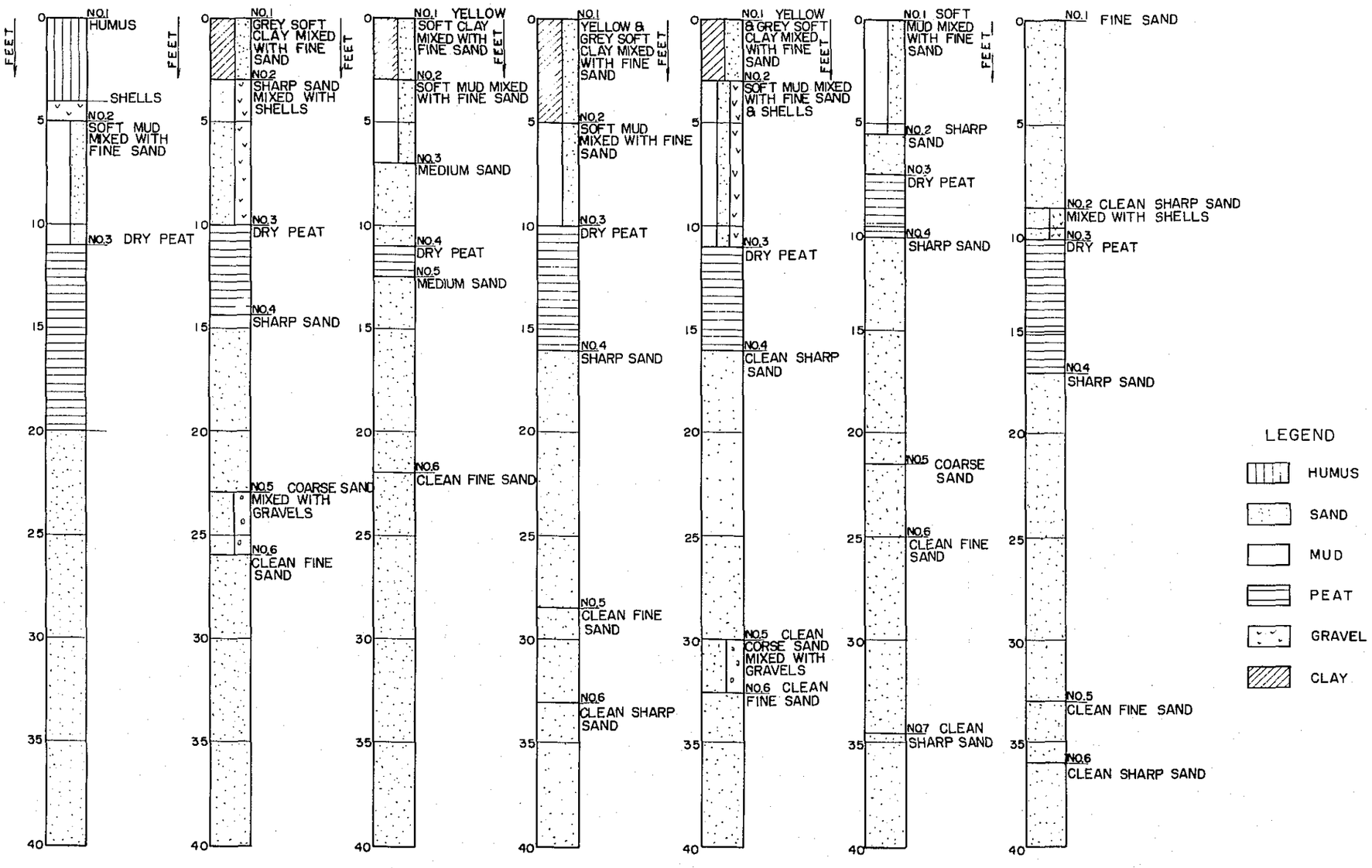
SCALE 1 : 6,000	TIN CAN ISLAND	JOB NO. 6241

Fig. 5 – 1.2



SCALE 1:100FEET	LAGOS EXECUTIVE DEVELOPMENT BOARD TIN CAN ISLAND OFF – SHORE BORINGS

Fig. 5 – 1.3



SCALE	LAGOS EXECUTIVE DEVELOPMENT BOARD
1: 60 FEET	TIN CAN ISLAND ON - SHORE BORINGS

Fig. 5-1.4

BORING RECORD

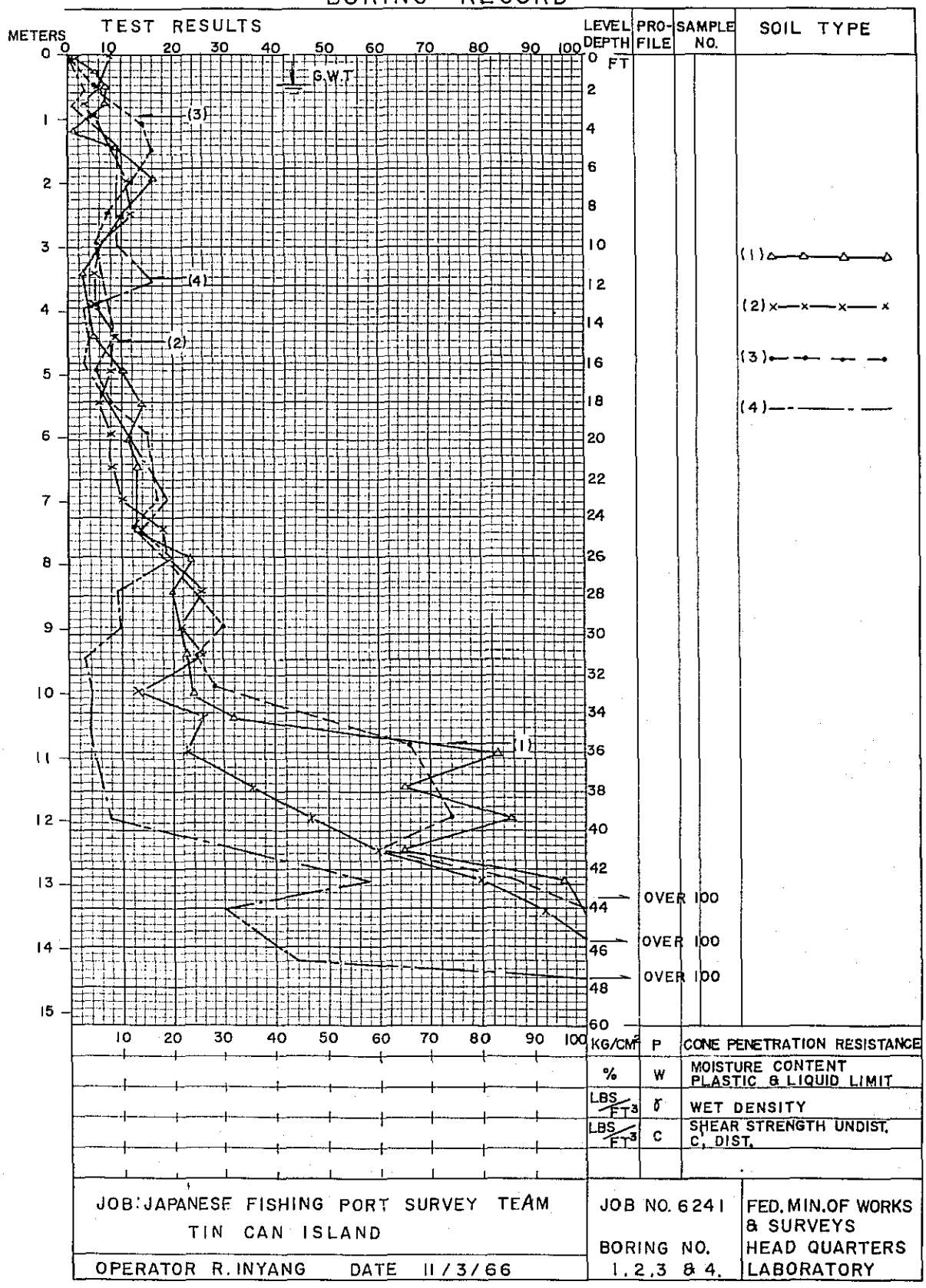
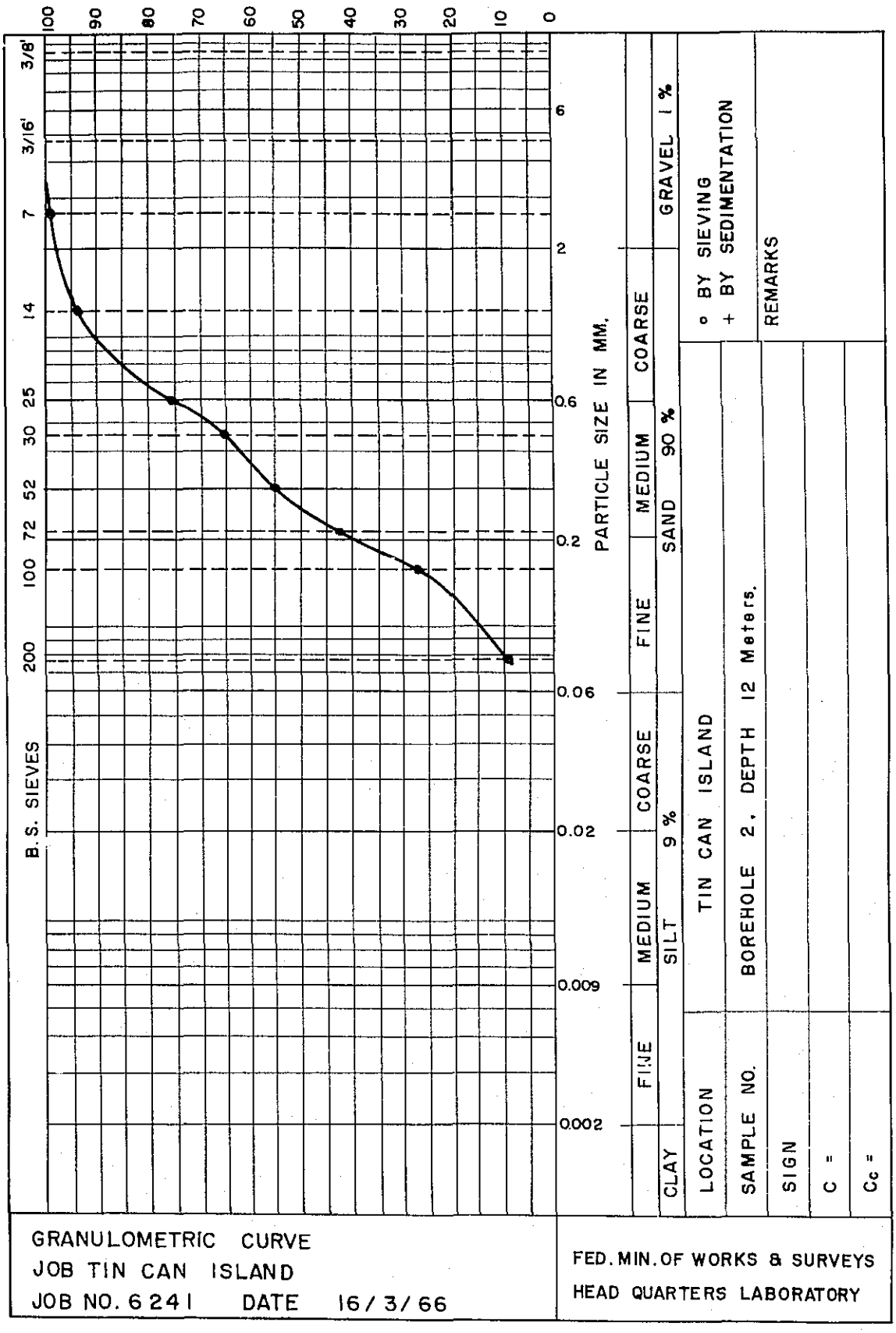


Fig. 5 - 1.5


PERCENT FINER BY WEIGHT
100 90 80 70 60 50 40 30 20 10 0
B.S. SIEVES
3/8' 3/16' 7 14 25 30 52 72 100 200
PARTICLE SIZE IN MM.
6 2 0.6 0.2 0.06 0.02 0.009 0.002
CLAY
FINE
MEDIUM
COARSE
SILT 9 %
FINE
MEDIUM
COARSE
SAND 90 %
GRAVEL 1 %
o BY SIEVING
+ BY SEDIMENTATION
REMARKS
LOCATION TIN CAN ISLAND
SAMPLE NO. BOREHOLE 2, DEPTH 12 Meters.
SIGN
C =
Cc =
GRANULOMETRIC CURVE
JOB TIN CAN ISLAND
JOB NO. 6241 DATE 16/3/66
FED. MIN. OF WORKS & SURVEYS
HEAD QUARTERS LABORATORY

PART III

CONCLUSION AND RECOMMENDATIONS

PART III
CONCLUSION AND RECOMMENDATIONS

CHAPTER 1
CONCLUSION

1.1 Comparison of both sites

In order to recommend the most suitable site for the Lagos fishing port, a comparative study was made on the respective construction cost, land availability, maintenance cost, land side and water side accessibility.

1) Land side accessibility

The Ijora site which is located in the central part of the Lagos city seems to be more easily accessible and nearer the market.

For the Tin Can Island, although a causeway will linked it to the Apapa district, the traffic at Apapa is often congested due to the activity of the commercial port.

2) Water-side accessibility

To access to the Ijora site, fishing vessels will have to pass through the commercial port. Although a channel will have to be dredged at the beginning, fewer maintenance works will be needed here.

On the Tin Can Island site, the long and winding channel will be to present some difficulties for the navigation of fishing vessels. Moreover, periodical dredging of the channel will probably be needed for maintenance involving more expenses in the maintenance works.

3) Cost comparison of construction

The comparative cost of the construction mainly concerned with the fishing port and land preparation is as follows:

	Ijora Site	Tin Can Island
- Port facilities (£)	1,770,000	1,800,000
- Land preparation (£)	130,000	200,000 - 700,000
Total (£)	1,900,000	2,000,000 - 2,500,000

The construction cost of the Tin Can Island site is much higher than that of Ijora site, because the former involves the larger land reclamation than the latter.

As to port facilities, the construction costs of both sites look almost the same in the above table. However, the construction cost of Ijora site will be lowered more on conditions that (1) no shale rock is found in the wharf area and (2) the soil to be dredged is used for reclamation than the designed volume, i.e. 50 percent of the total.

4) Land disposal

It is expected that after deducting the land for the port utilities, about 10 acres of land will be available for sale to private individuals or firms at the Ijora site. At the Tin Can Island, it is estimated that the land available for sale after the reclamation works will be in the order of 40 and 110 acres respectively.

On the assumption that the selling price per acre is £13,000 at the Ijora site and £7,000 at the Tin Can Island, the total price of land will be about £130,000 and £770,000 respectively.

5) Maintenance cost

It is estimated that the maintenance cost of the channel and the harbour basin will be £12,000 per year for the Ijora site and £28,000 for the Tin Can Island, assuming it 5 percent of the cost of dredging works. As it has been explained, the longer channel leading to the Tin Can Island involved more dredging works for maintenance.

6) Future extension

There is possibility for extension of berthing facilities for more than 5 large size berths of the Tin Can Island while this possibility does not exist at the Ijora site. However, it is considered that the berthing capacity at Ijora site will be sufficient to land catch fish in future.

1.2 Recommendable site

Though the final selection will be subject to the Government decision in respect to both Ijora and Tin Can sites, it seems that the Ijora site is preferable according to the explanations in the previous paragraph.

CHAPTER 2
SOCIAL & ECONOMIC BENEFITS

2.1 Primary benefits

Construction of the fishing port at Lagos will remove the inconveniences caused by the insufficient port facilities: the waiting time of the ships entering the port will be minimized, the handling of the catches landed quicken and the losses caused by inadequate handling diminished. This new situation will cause more of the loose chartered foreign vessels to enter this port and, as a natural result, more frozen fish will be landed.

Accordingly, more animal protein will be provided to the people in and around Lagos and its hinterland than before the proposed fishing port is constructed, and will thereby greatly contribute to the maintenance and enhancement of health of the inhabitants. The report will not touch upon the benefits to be derived from the development of fishing other than by the above-mentioned vessels, as it involves various problems and no great development thereof can be expected.

According to rough estimation, the increased amount of frozen fish which will be landed at the new port will provide the people in the said area with over 100 grammes per head of pure animal protein and about 30 grammes per head of edible oil. Other than these, more alimentary elements contained in the fish will be obtained for the people.

When viewed in terms of the national economy, this new situation will bring about an increase in the supply of pure protein of about 600 tons as well as in the supply of other nutritious elements, and the total value of these increases will amount to about £200,000 a year.

2.2 Secondary effect

There will be other benefits which cannot be expressed in terms of monetary value, namely, intensive landing of fish and effective distribution of fish in a shorter period of time resulting in cheaper price of fish, and easy gathering of necessary data, which makes it easier for the Nigerian Government to establish fishery policies and policies for the improvement of national health and economy.

Meanwhile part of the reclaimed land can be sold to cover a part of the construction expenses. Other income can also be expected in the form of charges imposed on the vessels entering the port and fish landed. However, you should not expect a large revenue from these charges. It may be less than 2-3 % of the total value of the fish landed.

2.3 Justification

The construction of this port can be expected to bring about the above-mentioned benefits to the national economy. Therefore, the Mission believes that the project is worth arranging budget as a social capital overhead.

CHAPTER 3
RECOMMENDATIONS ON FISHERY

Generally speaking, it seems that the purchasing power of the nation for animal protein is relatively low at present. However, for reasons stated below, it is considered that the national demand for animal protein which is latent now, will increase in future.

1) Nation prefer for foodstuffs containing animal protein;
2) National life will enrich with the economic growth;
3) Traffic facilities will replete;
4) Distribution facilities of foodstuffs will replete;
5) Population will increase.

It is quite conceivable to plan to meet the demand for animal protein by use of not only meat but also fish. However, the acquisition of fish protein in much larger quantities is by no means an easy task. It involves many problems. Especially, the actual situations referred to in the following recommendations should never be disregarded.

3.1 Domistic fishing

It is necessary to take protective measures for the canoe fishing for reasons enumerated below:

1) The canoe fishing has its own history. It is conducted entirely on the basis of the national technic and fund. It gives a mean of living to a number of Nigerian fishermen.
2) Although the production by this type of fishing does not amount to so much, it is contributing to some degree as a supply source of protein to the people in the wide coastal districts.
3) Fishermen are generally poor and from the national interest viewpoint, governmental aid and protection are indispensable to the fishermen to

maintain their stabilized production.

The conceivable means for this purpose are to give encouragement and guidance by the Government for motorization of canoes, improvement of fishing implements including necessary technical training and also setting up canoe bases.

3.2 Pelagic fishing

It is felt that one of the objectives of constructing a fishing port in Lagos consists in making it a base for pelagic fishing. However, it is necessary to reflect on the fact that the absence of an adquate fishing port facility does not constitute the sole reason for the tardy progress of pelagic fishing. In order to run this type of fishing industry, there are many strict prerequisites for which the major ones are given below:

1) Adaptability of the crew to this type of fishing and operation of pelagic fishing industry
2) To raise a large sum of necessary funds, independent and local
3) Better terms and conditions for financial loans with domestic financial organs
4) Prospects of this specialized industry

Item 4) will involve, for instance, the following problems:

a) Acquisition of the advanced fishing technique
b) Availability of proper fishing boats at reasonable prices
c) Availability of fishing implements, various instruments and equipments of vessels at moderate prices, and repairshops for their repairs and replacements
c) Attainment of the reasonable cost, terms and technique of ship repairs

It is feared that each item enumerated above is far from reassuring at

the present moment. Catch in the fishing grounds at a very long distance adds naturally to the fishing cost, while restricting the volume of catch per navigation and resulting in high selling price of fish which could not be marketable. Therefore, the pelagic fishing will not pay. In other country, there are several cases of unsuccessfulness in keeping pelagic fishing in spite of their well accommodated fishing port.

3.3 Institutional measures

The examination of fishing for the purpose of establishing proper measures for its development requires a thorough study of its actual state. Therefore, an investigation on the present fishery situation throughout Nigeria will have to be made immediately as follows:

1) Condition of catch involving preparation of statistics by species and by regions;
2) Condition of fishing boats involving type, fishing gear and fishing method;
3) Condition of fishermen concerning their number of population by regions and by types of fishing, their economic life;
4) Condition of distribution, for instance, facilities and capacity, price of fish.

In order to ensure the positive and quick preparation of such statistics and data of the actual state of fishing, appropriate measures such as the formulation of provisions will be necessary. This will also involve budgetary measures by the Government.

3.4 Fish distribution organ

Fish markets seem to be owned and managed by the producers. It appears that the consumers' price fluctuates considerably due to the operation

of middlemen rendering the end price of fish often high.

With the anticipation of the development of canoe fishing and the increase in production, it will be necessary to consider such measures as the establishment of public markets in appropriate places for the benefits of consumers as well as producers.

3.5 Fish processing industry

The fish processing industry referred to here involves manufacturing of tinned fish and fish meal. The price of such food is considerably high as it includes the processing cost and various other costs.

The minimum conditions necessary for inaugurating an enterprise of this kind are as follows:

1) Processed fish must be sold at very low prices;

2) Material fish must be obtained at low prices;

3) There must be a clear prospect of the available materials. In other words, sufficient quantity of low-price fish must be obtained whenever it is desired.

Considering the actual situation of the national economy and fishery, it is rather difficult to establish a fish processing enterprise on a commercial base. In the present situation, it is necessary to consider the limitation of the supply in meeting the demand.

If such material fish should become available in future, it would be consumed directly by the nation through the distributing net work of fresh fish before it is used as material. This will contribute to the welfare of the nation.

3.6 The Government's support

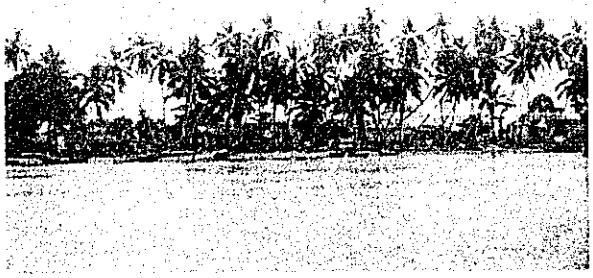
The ultimate objective of this fishing port lies in the stabilized supply of protein through wider distribution system of frozen fish landed by loose char-

tered foreign vessels. Therefore, it is necessary to guide and encourage this type of fish supply so that nation can be more benefited by using the fishing port effectively in future.

3.7 Consideration for protein sources

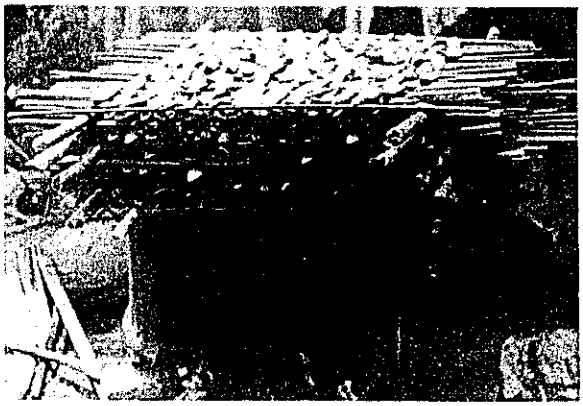
Nigerian economic development is making an amazing progress. Accordingly the demand for animal protein will increase. However, the fish supply only should be difficult to meet the demand of animal protein. So that in parallel to the fish, the other protein sources are recommendable to be exploited.

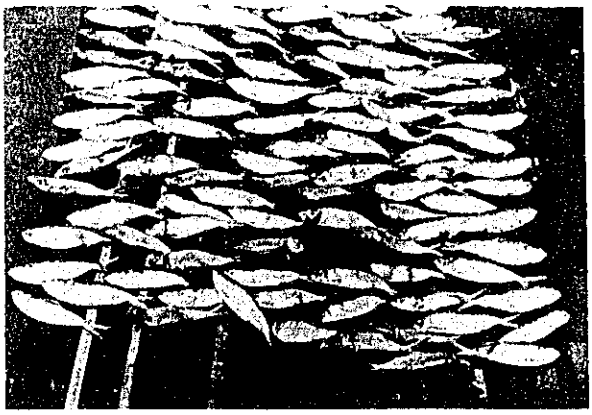
Canoe fishing



Canoe fishing village in the vicinity of Lagos

Bonga caught by a canoe are stored after they are broiled in the fishing village in the way shown in the photograph





Bonga being broiled

Dried fish at a local market

CHAPTER 4

RECOMMENDATIONS ON CONSTRUCTION OF FISHING PORT

4.1 Recommendations

It is recommendable that after selection of the fishing port site by the Government, further investigations and detail design have to be performed before construction.

1) Soil survey

As to Ijora site the soil survey has not yet been carried out. The planning in this report is based on the assumption made from the near-about soil conditions. Therefore, the soil survey is to be performed before detail design. Regarding the Tin Can Island site, though there are rather useful data, more detailed survey will be also necessary before final design. The contents of both design and cost estimate may be changed to the results of the detailed survey.

2) Field survey

The planning in this report is made on the basis of the maps or charts with a scale ranging 1:1,200 to 600 which were provided with during the Mission's stay in Lagos. And the data of levelling and sounding are also not sufficient to meet the designing requirements.

Accordingly, it is necessary to carry out such field surveys for the correct calculation of dredging and reclaiming volumes.

3) Survey of siltage

The maintenance of the harbour and channel is affected by the sand movement.

In Ijora site it is quite important to investigate the current condition to be changed after reclamation, and in Tin Can Island to make clear of the flow condition of current and sand movement in Port-Novo Creek.

APPENDIX I

GENELAL CONDITIONS

APPENDIX 1
GENELAL CONDITIONS

1.1 Meteorology

1.1.1 Wind

Lagos is affected both by the land and sea breezes, while the prevailing is the southwest wind.

According to the data observed at the Ikeja Airport in the suburbs of Lagos, the south-west winds appear most frequently in August and September. It is said that fierce wind such as typhoon, hurricane seldom visits this area. Fig. 1-1.1 shows the monthly wind diagram as observed at Ikeja.

1.1.2 Rainfalls

The seasons in Nigeria can broadly be divided into the dry and the wet season.

The following table shows the mean of monthly rainfall for the past 70 years and the mean of rainy days for the period of 9 years. This table shows that the wet season lasts from May to July, while the dry season from August to April. It is said that the creek side has never been inundated with water even in the rainy season.

MONTH	RAINFALL (inch)	NUMBER OF RAINY DAYS (rainfall: over 0.01")
Jan.	1.1	4
Feb.	1.8	5
Mar.	4.0	7
Apr.	5.8	10
May	11.0	17
June	18.2	22

MONTH	RAINFALL (inch)	NUMBER OF RAINY DAYS (rainfall: over 0.01")
July	10.4	15
Aug.	2.6	9
Sept.	5.5	17
Oct.	8.1	16
Nov.	2.8	8
Dec.	1.0	3
Total	72.3	133

Source: Meteorological Service, Lagos

1.1.3 Air temperature

The air temperature variation in Lagos is generally small through the year and through the day. The variation in temperature becomes larger toward the interior.

The following table shows the monthly means of the daily maximum and minimum temperatures at Lagos and Ikeja.

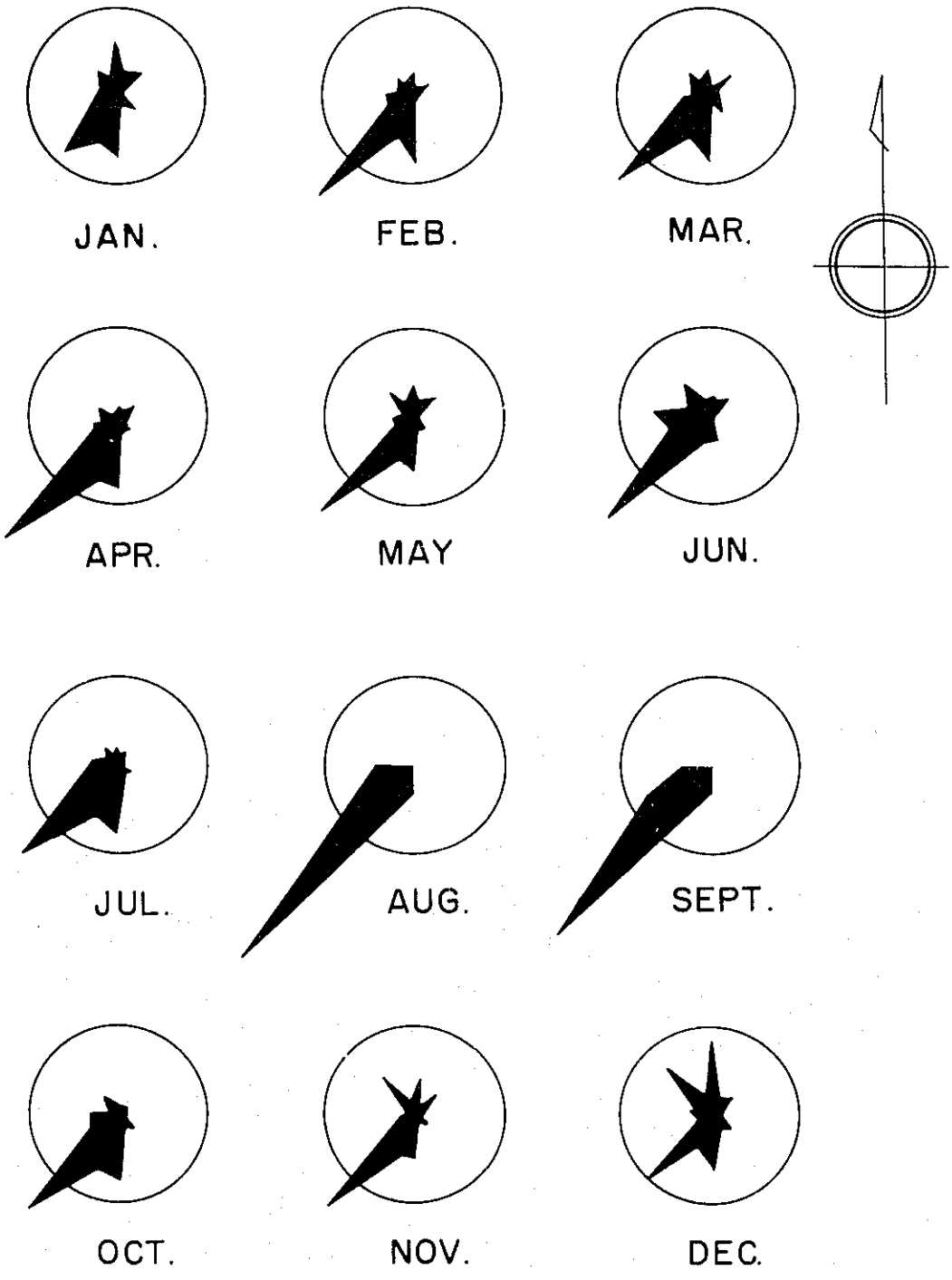
	LAGOS		IKEJA	
MONTH	MAX. (°F)	MIN. (°F)	MAX. (°F)	MIN. (°F)
Jan.	87.6	75.3	90.5	69.8
Feb.	88.5	76.7	91.0	72.6
Mar.	88.5	77.9	91.5	73.1
Apr.	87.8	77.0	90.2	71.7
May	86.7	76.1	87.9	72.1
June	83.6	74.4	84.2	71.2
July	80.9	74.4	82.2	70.0
Aug.	80.9	73.7	81.7	69.7

	LAGOS		IKEJA	
MONTH	MAX. (°F)	MIN. (°F)	MAX. (°F)	MIN. (°F)
Sept.	82.4	73.7	83.9	70.5
Oct.	84.4	74.2	85.7	71.0
Nov.	87.0	74.5	89.3	71.7
Dec.	87.8	76.1	89.3	70.9
Mean	85.5	75.4	87.3	71.2

Source: Meteorological Service, Lagos

Fig. I-I.I

YEARLY AVERAGE WIND DIRECTION DIAGRAM IN IKEJA
(SUBURB OF LAGOS)



Note : The illustrated, Circumference shows frequency of 20 %
: From " Land and People in NIGERIA"

1.1.4 Humidity

The humidity in Lagos varies quite inconspicuously throughout the year. The table below is the record of the mean relative humidity in Lagos.

MEAN RELATIVE HUMIDITY IN LAGOS

MONTH	AT 10.00 (%)	AT 16.00 (%)
Jan.	84	70
Feb.	82	70
Mar.	79	73
Apr.	80	75
May	82	77
June	86	81
July	85	81
Aug.	83	79
Sept.	85	81
Oct.	84	76
Nov.	82	71
Dec.	83	76
Mean	83	76

Source: Meteorological Service, Lagos

1.2 Sea conditions

1.2.1 Tide

Tide observations are being carried out with the tide-gauge installed on the breakwater at the entrance of the Lagos harbour.

According to the annual tide issued by the Federal Surveys, the main characteristics of the tide are as follows:

M.H.W.S. = 3.1 ft.

M.H.W.N. = 2.3 ft

M.L.W.S. = - 0.3 ft.

M.L.W.N. = 0.7 ft.

M.S.L. = 1.5 ft.

The harbour datum is fixed at 9.574 ft. below the No. 1 bench-mark of the Federal Surveys which is under the signal station on the East Mole of the Lagos Harbour.

It is said that the harbour datum was decided on the basis of over 12 months observation. An engineer of the Nigerian Ports Authority told that the tide is almost constant through the year and there is no remarkable change, extraordinary high tides nor tidal deviations.

1.2.2 Other conditions

The flood and ebb of the tide seems to cause considerable rapid current in the channel connecting the open sea with the Lagos Lagoon. Judging from eye-observations, the velocity of the current seems to be about 2-3 knots at maximum.

Several shallow parts and shoals are found in the channel, but siltage does not seems to be serious. A little amount of dredging is being made by N.P.A. for the maintenance of the channel.

It was observed that the corrosion of steel materials is remarkable and damage to timber materials by marine borers is severe.

1.3 Geological condition and earthquake

1.3.1 Geology

According to the geological map of Nigeria issued by the Ministry of Works, the area in and around Lagos is formed of alluvial deposit. The most

part of the alluvial deposits comprises clean sand but peat, organic soil or silty strata probably exist near the ground surface in some places.

Some peat strata has been observed in the Tin Can Island. It is said that shale rocks exist near the sea bed at the Apapa Dockyard, so the Ijora site is feared to have the same condition.

1.3.2 Earthquake

There seems to have no history of earthquake in Nigeria, accordingly no seismic force is taken into account for the structure design.

1.4 City planning, traffic and port

1.4.1 City planning

The Lagos Executive Development Board respnsible for the city planning is now contemplating the repartition of Lagos into the following classification.

Lagos Island	Administrative and commercial zone
Ikoyi Island	Residential zone
Victoria Island	Mainly residential zone
East part of Apapa	Commercial port zone
West part of Apapa	Residential zone
South part of Apapa	Industrial zone
Iganmu	Industrial zone
Ebute Metta	Residential zone
Suru Lere	Residential zone

1.4.2 Land traffic

The land traffic condition in Lagos can be summarized in terms of the fishing port planning as follows.

a) Iddo Island is a key point of the land traffic in the Lagos city. It is connected with the Mainland and the Lagos Island. The railway terminus is also located in this island.

b) The roads in the Lagos Island are unsuitable for high speed traffics. The traffic is generally heavy and congested.

c) Carter Bridge has the heaviest traffic in the city. It is quite congested especially during the rush hours both in the morning and evening, and constitutes a great bottleneck in the city traffic.

d) Apapa road used for the transport of cargo to and from the Apapa commercial port is often overcharged and the traffic flow comes very often at a stand still.

e) The suburban roads from Lagos to Ibadan and to other districts get fewer traffic and are generally in good condition.

To relieve the heavy traffic on the Carter Bridge, a new Mainland Bridge is now under construction.

1.4.3 Port

Apapa commercial port has nine berths of quay walls of 27 feet deep. Four more berths are now under construction and two of them are already in usable condition.

Each quay is equipped with wharf cranes; a port railway and water supply facilities are available at the quay. There are also a shipyard and repair shop for automobiles and locomotives.

APPENDIX 2
PLANNING OF BERTH

APPENDIX 2
PLANNING OF BERTH

2.1 Method of calculation

2.1.1 Basic equation

It is assumed that the fishing vessels enter in the Poisson type, and come alongside of the empty berth in order of her arrival and that they leave the berths after receiving the service of an exponential type within the service time. If it is assumed that the fishing vessels are to make a queue in case that they cannot come alongside of the berths all at once, relations among number of berths, waiting-time and so on can be computed by the following formulas. (queueing model of plural channels type)

$$P_n = P_0 \frac{(\lambda/\mu)^n}{n!} \quad (0 \leq n < c)$$

$$P_n = P_0 \frac{(\lambda/\mu)^n}{c!\, c^{n-c}} \quad (n \geq c)$$

$$P_0 = \frac{1}{\sum_{n=0}^{c-1} \frac{(c\rho)^n}{n!} + \frac{(c\rho)^c}{c!\,(1-\rho)}}$$

where in,

λ : average arrival intensity

μ : average service intensity per channel

c : number of channels

n : number of vessels existing in the harbour at an optional time

P_n : stationary probability in which number of ships existing in the harbour is n.

$$L_q = \frac{\rho(C\rho)^C}{C\ !\ (1-\rho)^2} P_o$$

$$P(>o) = \frac{(C\cdot\rho)^C}{C\ !\ (1-\rho)} P_o$$

$$P(>\tau) = \exp[-c\mu\tau(1-\rho)] \cdot P(>o)$$

$$P(\geq n) = 1 - \left[\frac{P(>o)C!(1-\rho)}{(C\rho)^C} \sum_{i=0}^{n-1} \frac{(C\rho)^i}{i\ !}\right] \quad (n<c)$$

$$P(\geq n) = [P(>o)]\rho^{n-c}$$

$$t = \frac{L_q}{\lambda}$$

$$L_d = \frac{1}{1-\rho}$$

$$W_d = \frac{W}{P(>o)} = \frac{1}{c\mu(1-\rho)}$$

where in,

L_q : average number of vessels in the queue.

$P(>o)$: probability in which the waiting takes place.

$P(>\tau)$: probability in which waiting time is more than τ

$P(\geq\mu)$: probability in which number of vessels in the queue is more than n.

t : average waiting-time.

W_d : average waiting-time for waiting vessels only.

$\rho = \lambda/c\mu$: intensity of quay utilization.

2.1.2 Division of vessel types

According to the vessel types divided into i = 1, 2, ... , n, the types of quays are to be divided into j = 1, 2, ... , n. Number of vessels and number of berths in each group are as follows:

vessel type,		number of those vessels	
i = 1, ...		"	N_1
i = 2, ...		"	N_2
⋮		⋮	⋮
i = n,		"	N_n

quay type $j = 1$ ...number of berths of this kind of quay .... S_1

$j = 2$ " .... S_2

$j = n$ " S_n

If ($i = 1 < 2 < \ldots < n$) approximate size of vessels and ($j = 1 < 2 < \ldots < n$) approximate water depth of quays are assumed, the vessels of

$i = 1$ can come alongside of all quays, $j = 1, 2, \ldots, n$

$i = 2$ cannot come alongside $j = 1$ and

can come alongside $j = 2, 3, \ldots, n$

Therefore, out of number of vessels of $i = 1$, N_1,

number of vessels utilizing the quay of $j = 1$ ..... N_{11}

" $j = 2$ ..... N_{12}

" $j = n$ ..... N_{1n}

(where in, $\sum_{j=1}^{n} N_{1j} = N_1$)

Likewise, out of number of vessels of $i = 2$, N_2

number of vessels utilizing the quay of $j = 2$ ..... N_{22}

" $j = 3$ ..... N_{23}

" $j = n$ ..... N_{2n}

(where in, $\sum_{j=2}^{n} N_{2j} = N_2$)

It will be considered to seek S_1, S_2 ..... and S_n in case that N_1, N_2, ... and N_n are known.

2.1.3 The most suitable number of berths

In the planning of a quay, two factors are to be taken in to consideration. One is the provision to offer as much convenience as possible for the vessels to enter the port and the other is the avoidance of overinvestment in facilities. In other words it is reasonable that the planning is so made that the total of the construction cost and the maintenance and operation cost and the cost or loss caused upon vessels waiting for berth would be kept at the minimum.

In the case of the proposed fishing port, the non-utilization of the quay represents a loss for Nigeria, but the loss incurred upon the vessels waiting for the berth is borne by the vessel owners. Because foreign vessels are involved, in the calculation of the cost factors to be considered in the planning of the quay, it is not adequate to deal with the former loss as of the same nature as the latter. Nevertheless, if for economical reasons, the number of berths is reduced, resulting in larger and more frequent periods of waiting for the moorage, this will decrease the number of foreign vessels calling at the port.

For this reason, in order to keep the probability of berth-waiting at the reasonable level, a study was made, on the basis of the theory of queues, of various case of waiting-time and number of waiting vessels.

The following things are considered as indications for determining the most suitable number of berths.

a) The less the number of berths of each type, S_i , the more advantageous, taking into account an increase of construction cost and maintenance and administration cost.

b) The less the average waiting-time of vessels of each type, t_i , the

more advantageous.

c) The less the average waiting-time of only waiting vessels, W_{d1}, the more advantageous.

d) The less the average number of vessels in the queue, L_{q1}, the more advantageous.

e) The less the idle time of berths, the more advantageous.

The most suitable combination of S_1, S_2, ... and S_n will be chosen against numer of vessels N_1, N_2, ... and N_n known on the basis of the indication of the above five items.

Namely, t_1, W_{d1}, L_{q1}, and W_1 will be calculated against the several combinations of S_1, S_2, ... and S_n and those will be referred to the above five items. As the results, the most suitable combination of S_1, S_2, ... and S_n is to be chosen.

When average service-time of vessel type, $i = 1$ .... T_1

" $i = 2$ .... T_2

" $i = n$ .... T_n

Idle time of berths, W_j is shown as below.

In the quay of type, $j = 1$, $W_1 = 365 \cdot S_1 - T_1 \cdot N_{11}$

" $j = 2$, $W_2 = 365 \cdot S_2 - T_1 \cdot N_{12} - T_2 \cdot N_{22}$

" $j = n$, $W_n = 365 \cdot S_n = \sum_{i=1}^{n} T_i \cdot N_{in}$

Next, waiting-time will be considered.

The berths used by vessels of type, $i = 1$ are $j = 1, 2, \ldots$ and n. Accordingly,

number of channels in this case; $C_1 = \sum_{j=1}^{n} S_j$

total number of vessels using these berths; $\sum_{i=1}^{n} N_i$

Accordingly,

average arrival intensity in this case; $\lambda_1 = \frac{1}{365} \sum_{i=1}^{n} N_i$

Therefore, the waiting model of plural channels type can be utilized by using number of channels, C_1 and average arrival rate, λ_1 , as to the vessels of vessel type, i = 1.

Likewise, concerning the vessels of vessel type i = 2

number of channels ..... $C_2 = \sum_{j=2}^{n} S_j$

average arrival intensity ..... $\lambda_2 = \frac{1}{365} \sum_{i=1}^{n} \sum_{j=2}^{n} N_{ij}$

From the above, average waiting-time of vessels of vessel type, i, is shown as below;

$$t_i = \frac{1}{\sum_{n=0}^{c-1} \frac{(\lambda/\mu)^n}{n!} + \frac{(\lambda/\mu)^c}{C!\left(1-\frac{\lambda}{\mu C}\right)}} \cdot \frac{(\lambda/\mu)^c}{\mu C(C!)\left(1-\frac{\lambda}{\mu C}\right)^2}$$

(where in, to μ and c in the equation are attached the same suffix as that of t).

Average service intensity per channel, μ_1 is shown as below.

$$\mu_1 = \frac{\sum_{i=1}^{n} N_i}{\sum_{i=1}^{n} T_i \cdot N_i}$$

$$\mu_2 = \frac{\sum_{i=1}^{n} \sum_{i=2}^{n} N_{ij}}{\sum_{i=1}^{n} \left(T_i \cdot \sum_{j=2}^{n} N_{ij}\right)}$$

$$\vdots \qquad \vdots$$

$$\mu_n = \frac{\sum_{i=1}^{n} N_{in}}{\sum_{i=1}^{n} (T_i \cdot N_{in})}$$

2.1.4 Distribution of vessels

When the queueing model of plural channels type is utilized, number of vessles of each type using berths of each type must be decided. Here, the berths are to be utilized in the following method.

a) The vessels will find the most suitable berths to themselves. Unless the most suitable berths are empty, the vessels will find larger berths.

b) When the plural berths of same type are empty, the berth with longer idle time will be chosen.

c) When there is no empty berth, the vessels will make a queue in order.

If the above factors are assumed, number of vessels of each type distributed to each berth are to be approximately given as shown below.

Namely,

the vessels of vessel type, $i = n$ can use only berth of type, $j = n$. Therefore, $N_{nn} = N_n$.

The vessels of vessel type, $i = n - 1$, can use berths of type, $j = n - 1$ and type, $j = n$. Therefore,

$$N_{(n-1)(n-1)} = \frac{S_{n-1}}{S_{n-1} + S_n} (N_{n-1} + N_n)$$

$$N_{(n-1)n} = \frac{S_n}{S_{n-1} + S_n} (N_{n-1} + N_n) - N_n$$

The vessels of vessel type, $i = 1$ can use all berths, $j = 1, 2, \ldots, n$. Therefore,

$$N_{11} = \frac{S_1}{\sum_{j=1}^{n} S_j} \sum_{i=1}^{n} N_i$$

$$N_{12} = \frac{S_2}{\sum_{i=1}^{n} S_j} \sum_{i=1}^{n} N_i - N_{22}$$

$$\vdots$$

$$N_{1n} = \frac{S_n}{\sum_{j=1}^{n} S_j} \sum_{i=1}^{n} N_{in} - \sum_{i=2}^{n} N_{in}$$

2.2 Application to the fishing port in Lagos

2.2.1 Division of vessel types and quay types

Judging from the above mentioned types of fishing vessels, it is considered that it is suitable to divide type of quays and types of fishing vessels as below:

	Type of quay	Type of vessels using mainly
A	Length of berth 300 feet water depth 25 "	3,000 - 1,500 G/T class
B	Length of berth 200 feet water depth 18 "	500 G/T class
C	Length of berth 100 feet water depth 15 "	Smaller than 50 G/T class
D	Bulkhead	Canoe

As to canoes and fishing vessels belonging to C & D the evident values are not known and the ratio of those construction costs to total construction cost is much smaller. Therefore, 4 berths will be constructed for 10 units existing at present and the bulkhead utilized by canoes will be properly constructed, according to the configuration of the ground.

Accordingly, the above mentioned theory of queue can be applied to A and B only.

Therefore, n = 2.

Namely, types of vessels ..... i = 1, & i = 2

types of quays ..... j = 1, & j = 2

2.2.2 Time of landing

Acoording to Table 3-2.1 in the Report it is presumed that landing volume per voyage of vessels of type, i = 1 is 160 tons and landing pace is 100 - 150 tons/day. Accordingly, time of landing is about 1.6 days, but 2 days will be adopted as average service-time, when the rest, supply of goods and so on are taken into account.

And likewise it is presumed that the quantity of fish production per voyage of vessels of type, i = 2 is 500 tons and landing pace is 200 tons/day. Therefore, time of landing is 2.5 days, but 5 days will be adopted upon consideration in the like manner.

From the above

T_1 = 2 days, T_2 = 5 days

2.2.3 Number of fishing vessels

From Table 3-2.1, 3-2.2, in the Report number of fishing vessels is as below:

In 1970 ..... N_1 = 18, N_2 = 80

In 1975 ..... N_1 = 18, N_2 = 140

2.2.4 Results of calculation

The results calculated by the formulas of a queue of plural channels type are shown in the following Table AP. 2-1, and Table AP. 2-2.

2.2.5 Determination of the most suitable number of berths

According to the Table AP. 2-1 number of vessels of type, i = 2, waiting berth, increases one-sidedly in case of A-D (in case of S_2 = 1). Therefore, these combination (A-D) should be neglected.

As for average waiting-time (W_{q2}) of only vessels of type, i=2, the values are about 5.5 days at E-H (S_2 =2), about 2.6 days at I-L (S_2 =3), about 1.7 days at M-P (S_2 =4) and about 1.2 days in Q & R (S_2 =5). In view of the above facts, if the number of large berths are increased, waiting-time at large berth decreases as follows:

to increase from 2 to 3 berths; decrease of 2.9 days,

to increase from 3 to 4 berths; decrease of 0.9 days,

to increase from 4 to 5 berths; decrease of 0.5 days.

It is clear that the effect by increase is decreased with increase of number of berths. On the other hand, as for average number of vessels in a queue, Lg_2 the values are about 0.66-0.47 at S_2 = 2, about 0.09 - 0.07 at S_2 = 3, about 0.015 - 0.01 at S_2 = 4, and about 0.002 - 0.001 at S_2 = 5.

In the case of S_2 = 3, it has a possibility that about 0.1% of arriving vessels keeps waiting-time of 2.6 days, but it seems that these values are in approvable limit and it is not so much effective that the number of berths is increased to more than 3 berths. Accordingly, it is considered that the suitable number of large type berths is three.

Next, the number of medium berth S_1 will be decided, as the number of large berths has been already determined S_2 = 3. The influence of S_1 against the large vessels is gross in the case of S_1 = 0 among I-L (S_2 = 3), and that this influence does not come out in case of $S_1 \geq 1$ among I-L (S_2 = 3). Accordingly, it is considered that the suitable number of medium type berth is one S_1 = 1, as like as the study of the number of large berths.

In 1975, it will be possible to select the adequate number of berths as for 1970. According to this study there are more uncertain factors in the case of 1975, it is considered as suitable to select S_1 = 2 for medium type

berth, S_2 = 5 for large type berth and to leave the extending space for these berths.

As these calculation are approximate and there are many presumed factors in the used values, the obtained result is a general aim to the end. Moreover, at present there is a berth for the exclusive use of fishing vessels in the commercial port. The existing berth is used for economical reason for the time being as one of three large berths needed till 1970.

2.2.6 Planned number of berths

The results mentioned above are shown in the following Table.

Classification of berth	First stage (1970)	Future extension	Remarks
Berth length 300 ft. Water depth 25 ft.	2 berths	5 berths	For 3,000 - 1,500 G/T class vessels
Berth length 200 ft. Water depth 18 ft.	2 berths	2 berths	For 500 G/T class vessels
Berth length 100 ft. Water depth 15 ft.	4 berths	4 berths	Less than 50 G/T
Bulkhead	Appropriate length	Appropriate length	For canoe

Table AP. 2-1

In 1970

NO.	NUMBER OF BERTHS (UNIT)		AVERAGE WAITING-TIME (DAY)		AVERAGE NUMBER OF VESSELS IN A QUEUE (UNIT)		AVERAGE WAITING TIME OF WAITING VESSELS ONLY (DAY)		IDLE TIME OF BERTH (%)	
	S_1	S_2	t_1	t_2	L_{s1}	L_{s2}	W_{d1}	W_{d2}	W_1	W_2
A	0	1								
B	1	1								
C	2	1								
D	3	1								
E	0	2	2.45	2.45	0.656	0.656	5.48	5.48	0	40.3
F	1	2	0.343	2.16	0.0915	0.473	2.47	5.56	90.1	45.2
G	2	2	0.0575	2.16	0.0154	0.473	1.58	5.56	95.1	45.2
H	3	2	0.00923	2.16	0.00249	0.473	1.17	5.56	96.7	45.2
I	0	3	0.343	0.343	0.0915	0.915	2.46	2.46	0	60.0
J	1	3	0.0575	0.301	0.0154	0.0678	1.58	2.63	90.1	63.3
K	2	3	0.00923	0.301	0.00249	0.0678	1.17	2.63	95.1	63.3
L	3	3	0.00139	0.301	0.000377	0.0678	0.924	2.63	96.7	63.3
M	0	4	0.0575	0.0575	0.0154	0.0154	1.58	1.58	0	70.1
N	1	4	0.00923	0.0480	0.00249	0.0109	1.17	1.72	90.1	72.6
O	2	4	0.00139	0.0480	0.000377	0.0109	0.924	1.72	95.1	72.6
P	3	4	0.000188	0.0480	0.0000508	0.0109	0.765	1.72	96.7	72.6
Q	0	5	0.00923	0.00923	0.00249	0.00249	1.17	1.17	0	76.1
R	1	5	0.00139	0.00730	0.000377	0.00166	0.924	1.28	90.1	78.0

$N_1 = 18$, $N_2 = 80$, $T_1 = 2$ days, $T_2 = 5$ days.

Table AP. 2-2

In 1975

NO.	NUMBER OF BERTHS (UNIT)		AVERAGE WAITING-TIME (DAY)		AVERAGE NUMBER OF VESSELS IN A QUEUE (UNIT)		AVERAGE WAITING TIME OF WAITING VESSELS ONLY (DAY)		IDLE TIME OF BERTH (%)	
	S_1	S_2	t_1	t_2	L_{q1}	L_{q2}	W_{d1}	W_{d2}	W_1	W_2
A	0	1								
B	1	1								
C	2	1								
D	3	1								
E	0	2								
F	1	2	2.13	58.8	0.914	22.6	4.72	62.5	90.1	4.1
G	2	2	0.469	58.8	0.179	22.6	2.36	62.5	95.1	4.1
H	3	2	0.0952	58.8	0.0410	22.6	1.56	62.5	96.7	4.1
I	0	3	2.13	2.13	0.914	0.914	4.72	4.72	0	32.7
J	1	3	0.469	1.88	0.179	0.722	2.36	4.64	90.1	36.1
K	2	3	0.0952	1.88	0.0410	0.722	1.56	4.64	95.1	36.1
L	3	3	0.0216	1.88	0.00935	0.722	1.17	4.64	96.7	36.1
M	0	4	0.469	0.469	0.179	0.184	2.36	2.34	0	49.6
N	1	4	0.0952	0.372	0.0410	0.142	1.56	2.40	90.1	52.1
O	2	4	0.0216	0.372	0.00935	0.142	1.17	2.40	95.1	52.1
P	3	4	0.00464	0.372	0.00201	0.142	0.935	2.40	96.7	52.1
Q	0	5	0.0952	0.0952	0.00410	0.0414	1.56	1.56	0	59.6
R	1	5	0.0216	0.0835	0.00935	0.0321	1.17	1.62	90.1	61.6
S	2	5	0.00464	0.0835	0.00201	0.0321	0.935	1.62	95.1	61.6
T	3	5	0.000914	0.0835	0.000396	0.0321	0.775	1.62	96.7	61.6

$N_1 = 18$, $N_2 = 140$, $T_1 = 2$ days, $T_2 = 5$ days.

APPENDIX 3
PRIVATE ENTERPRISES

APPENDIX 3
PRIVATE ENTERPRISES

3.1 General

Besides the basic public facilities that will be established at the fishing port, it is considered that the private enterprises explained in the following paragraphs will be installed by private investments, at the risk and account of private enterprisers.

These enterprises are broadly divided into three categories according to the degree of necessity.

3.2 First priority enterprises

a) Cold storage and ice making plant

The cold stores in and around Lagos, are said to have the capacity of about 6,000 tons in total. However, it seems desirable to construct a cold storage at the wharf, from a viewpoint of efficiency. Since ice is mainly used by small vessels handling local fish, it had better to equip the ice plant.

It seems to be adequate so far to install at the wharf a cold storage with a capacity of about 1,500 tons, ice plant with a daily capacity of 30 tons, and ice storage room with a capacity of 200 tons, from viewpoints of volume of landings and the existing capacity of 6,000 ton cold storages.

b) Refrigerator trucks and cold vans

It will be adequate so far that 10 units of refrigerator trucks are used to transport frozen fish from the port to Ibadan and 3 units of cold vans to distribute the fish at several places on the way to Abeokuta.

c) Ship yard and engine repairing shop

The engines of refrigerator trucks, cold vans, fishing boats and other machines will be repaired here.

This factory will be indispensable. The shop will comprise Lathes, LS 450 x 800, LS 600 x 2,000, a fraise and a crane capable of lifting 3 tons, etc.

a) Radio communication equipment

It seems necessary to establish the base station capable of communicating by telegraph for a long distance and by telephone for medium and short distance.

The base will consist of one 500 W transmitter and two short wave receivers.

3.3 Second priority enterprises

a) Fish drying plant

Though there are various methods for drying fish, it is said to be economical to make a parallel arrangement of 9 sets of hot air box dryer at a plant.

Each dryer consists of one chimney, one blower, one chamber, two burners in one furnace and one 30 HP motor. Each dryer can be used for dry 3 tons of 5-10" raw fish up to 15-17 percent of water content in the time of 15 - 20 hours.

b) Fish netting factory

It seems better to produce fishing nets within the country instead of importing them from abroad, provided that a factory of minimum economical scale is capable of making 60 percent of total nets being used by 700 canoes at present. Such a factory will be capable of producing the fishing nets of 400 or 300 mesh, 210 d/2-3, 4-6, 9-12, 15 pitch for which the netting machines, winding machines, rewinding machines, heat set machines and boiler will be installed.

c) Fishing traps making factory

It will be profitable to establish a factory to make fishing traps utilizing bamboo and coconut which are available in Nigeria. This kind of enterprise is carried out also at Ghana.

A factory of the minimum economic scale is of making 4,800 ft^2 of bamboo-made fishing traps, for which 176 pieces of bamboo and 1,600 pieces of coconut will be used daily as raw materials. The factory will include 11 sets of the machines for bamboo processing, 7 sets for coconut processing, and a floor space of 50 ft x 65 ft.

3.4 Third prority enterprises

a) Packing shop

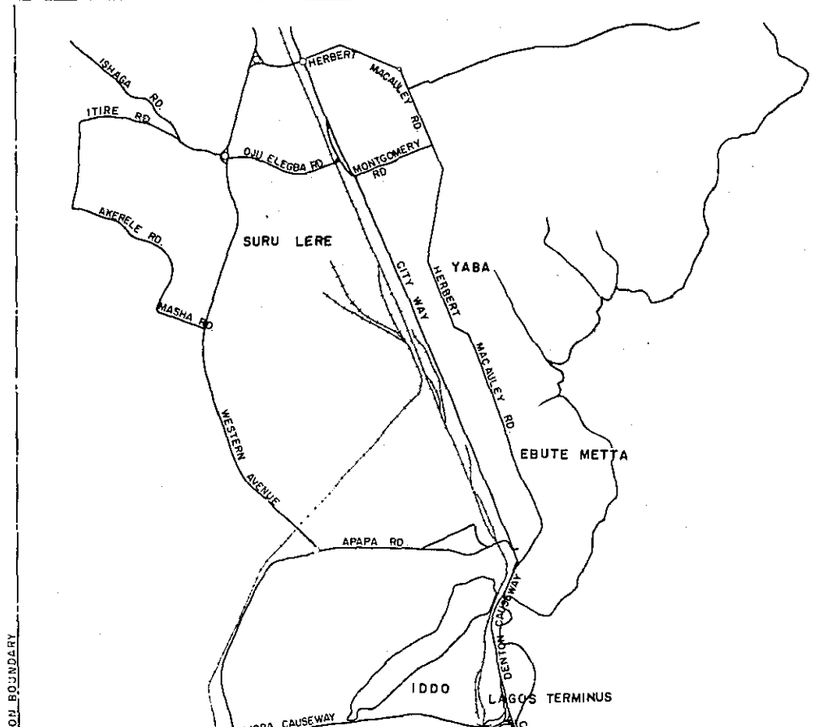
The future of this industry depends upon the increase of the landings of local fish. The factory will be capable of producing about 3,000,000 pieces of carton boxes using imported paper boards. It is felt that this is the minimum economic scale for a profitable enterprise. Local fish will be packed in this carton boxes and then frozen in the cold storage. This factory is not only for fish but also for various marchandises. It is hoped that such paper boards will be manufactured in future from imported pulp or local materials.

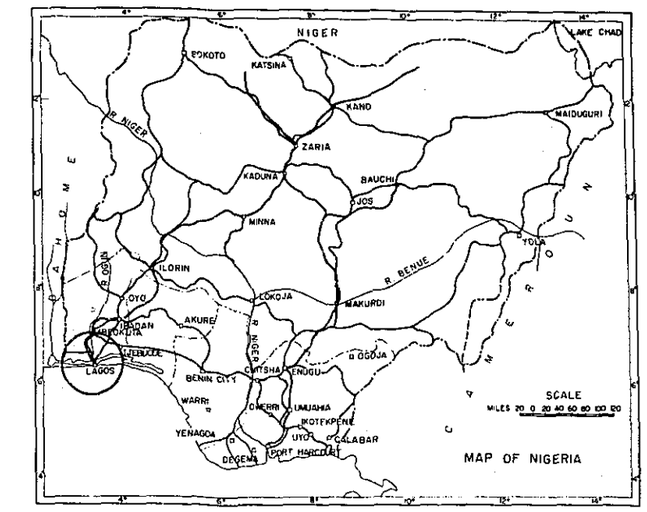
3.5 Rough estimate cost

The rough estimate cost of each enterprise of such scale as mentioned above is as shown in the following table.

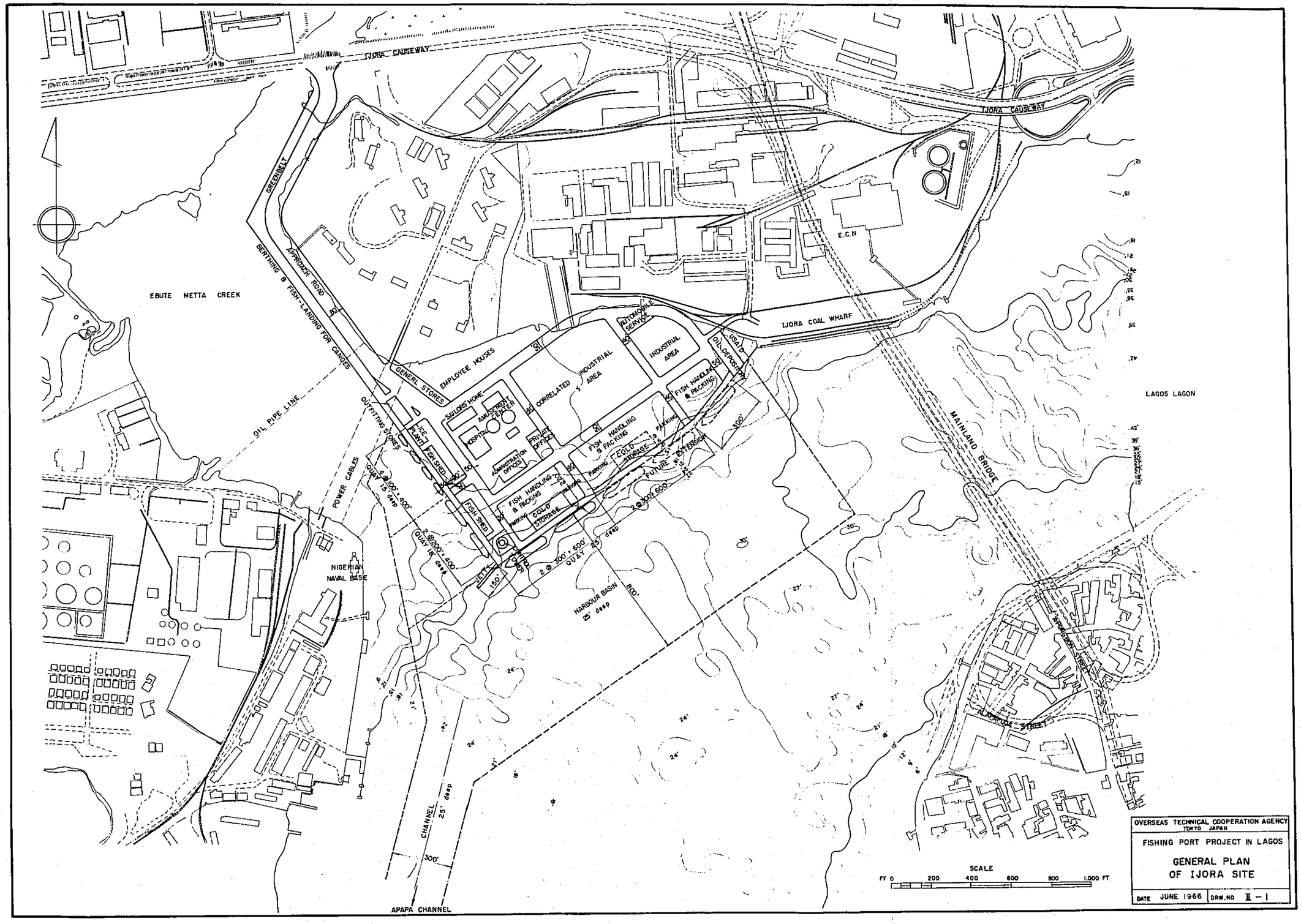
Table 3-1 ROUGH ESTIMATED COST FOR PRIVATE ENTERPRISES

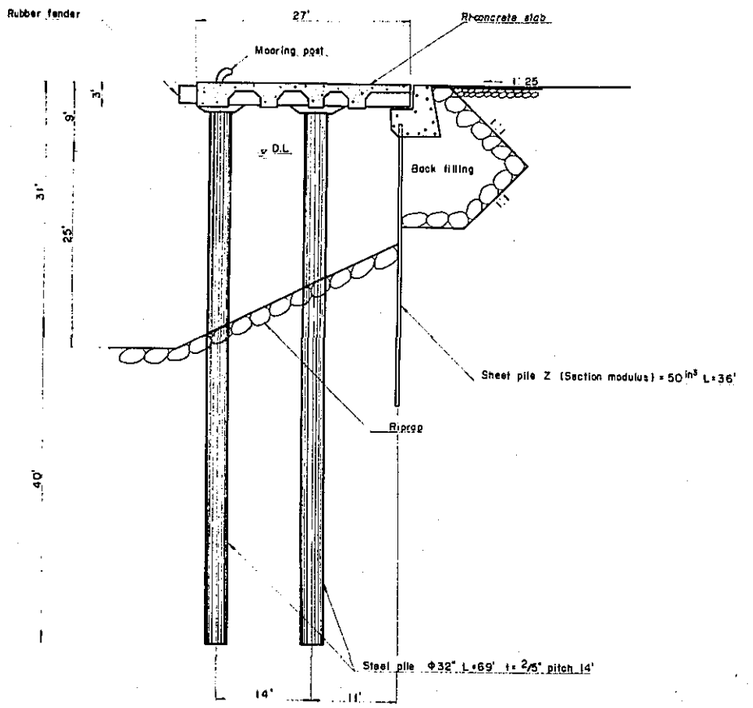
Item	Investment Cost (£)
First Priority	
Cold store	280,000
Engine repair shop	40,000
Lorry terminus (Refrigerator trucks & cold vans)	70,000
Radio station	10,000
Subtotal	400,000
Second Priority	
Fish dry plant	80,000
Fish netting	100,000
Fish trap	20,000
Subtotal	200,000
Third Priority	
Packing shop	70,000
Subtotal	70,000
Total	670,000
Breakdown: Plant	530,000
Housing	140,000





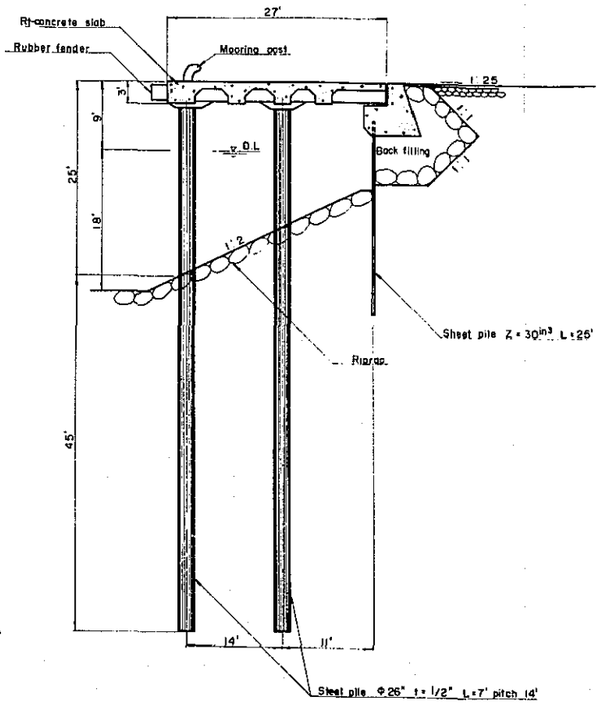
OVERSEAS TECHNICAL COOPERATION AGENCY TOKYO JAPAN	
FISHING PORT PROJECT IN LAGOS	
LOCATION MAP OF LAGOS	
DATE JUNE 1966	DRW. NO. I


IJORA CAUSEWAY
IJORA CAUSEWAY
GREENBELT
APPROACH ROAD
BERTHING & FISH-LANDING FOR CANOES
EBUTE METTA CREEK
E.C.N
IJORA COAL WHARF
AUTOMOBILE SERVICE
INDUSTRIAL AREA
EMPLOYEE HOUSES
GENERAL STORES
SAILORS HOME
AMUSEMENT CENTER
HOSPITAL
ADMINISTRATION OFFICES
PRIVATE OFFICES
ICE PLANT
FISH SHED
CORRELATED INDUSTRIAL AREA
FISH HANDLING & PACKING
COLD STORAGE
PARKING
FUTURE EXTENSION
OIL DEPOT
OIL PIPE LINE
OUTFITTING STORES
POWER CABLES
NIGERIAN NAVAL BASE
2 @ 200' × 400' QUAY 15' deep
2 @ 300' × 600' QUAY 25' deep
HARBOUR BASIN 800' × 800' 25' deep
CHANNEL 25' deep 300'
APAPA CHANNEL
LAGOS LAGON
MAINLAND BRIDGE
ALAPATAM STREET
SCALE
FT 0 200 400 600 800 1,000 FT
OVERSEAS TECHNICAL COOPERATION AGENCY
TOKYO JAPAN
FISHING PORT PROJECT IN LAGOS
GENERAL PLAN OF IJORA SITE
DATE JUNE 1966
DRW. NO II – 1



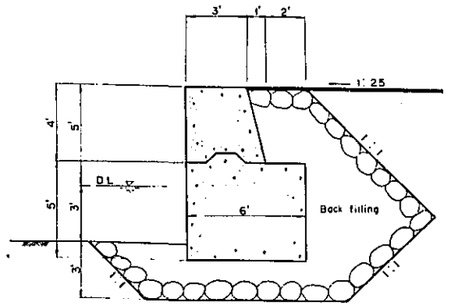
DEPTH OF 25 feet

SCALE 0 5 10 15 20 25



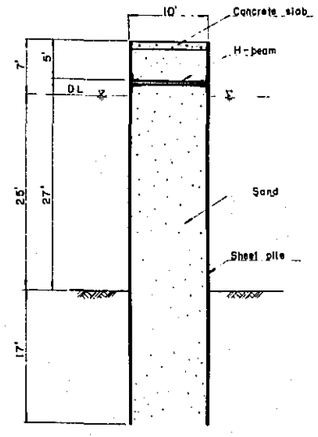
DEPTH OF 18 feet

SCALE 0 5 10 15 20 25



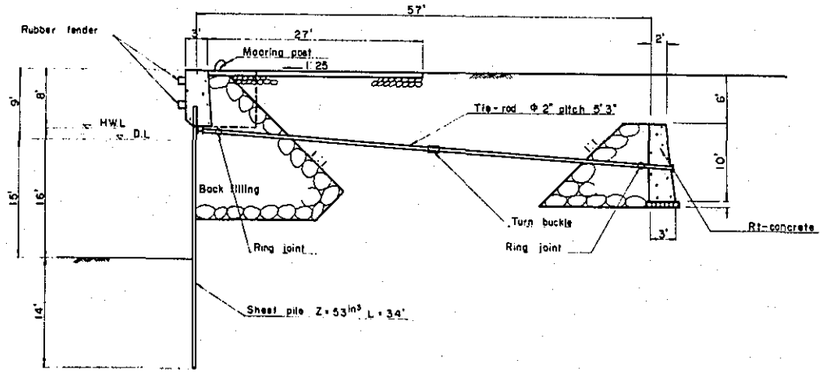
BULKHEAD FOR CANOE

SCALE 0 2 4 6 8



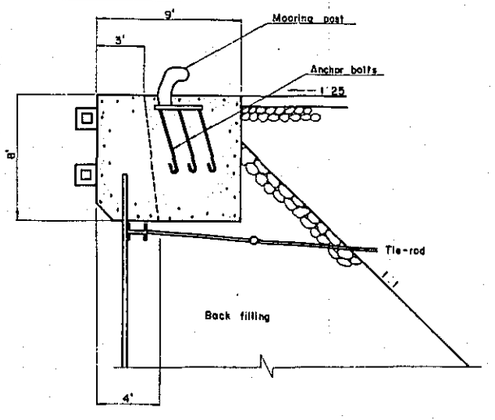
JETTY

SCALE 0 5 10 15 20 25



DEPTH OF 15 feet

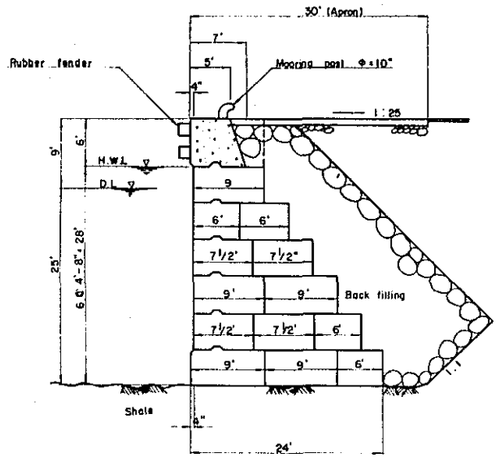
SCALE 0 5 10 15 20 25

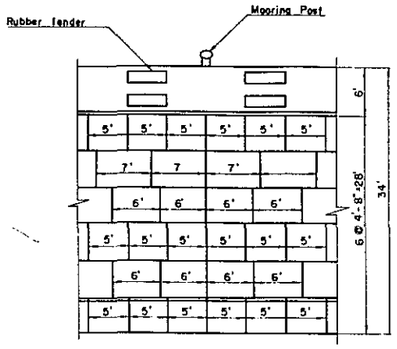


DETAIL OF CROWN

SCALE 0 2 4 6 8 10

OVERSEAS TECHNICAL COOPERATION AGENCY TOKYO JAPAN	
FISHING PORT PROJECT IN LAGOS	
TYPICAL CROSS SECTION OF QUAY AT IJORA SITE (CASE OF SOIL)	
DATE JUNE 1966	DRW. NO. I-2



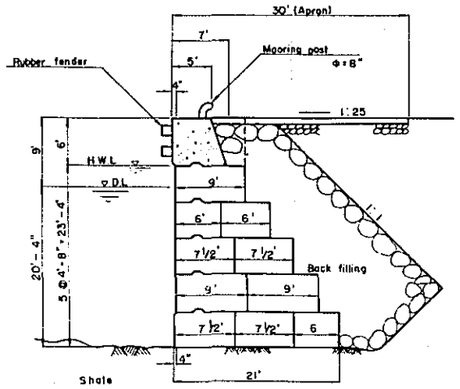


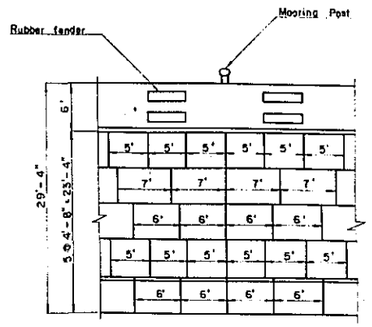
CROSS SECTION

FRONT VIEW

DEPTH OF 25 feet

SCALE 0 5 10 15 20 25



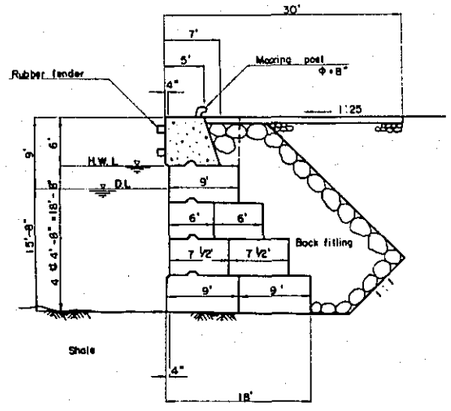


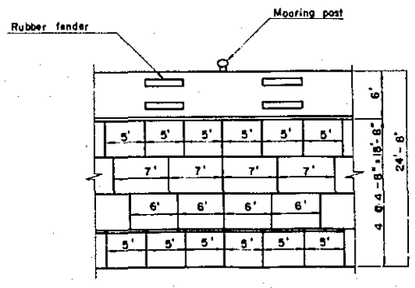
CROSS SECTION

FRONT VIEW

DEPTH OF 18 feet

SCALE 0 5 10 15 20 25



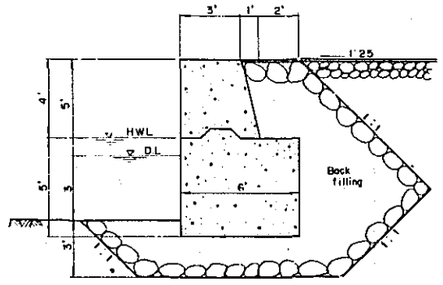


CROSS SECTION

FRONT VIEW

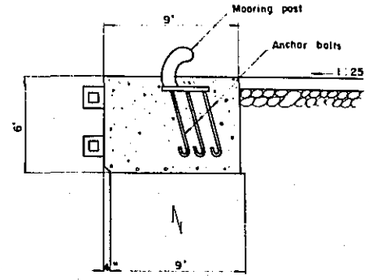
DEPTH OF 15 feet

SCALE 0 5 10 15 20 25



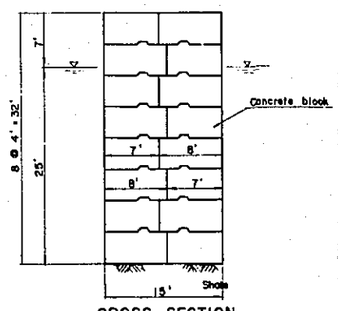
BULKHEAD FOR CANOE

SCALE 0 2 4 6 8

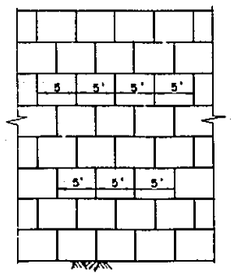


DETAIL OF CROWN

SCALE 0 2 4 6 8 10



CROSS SECTION

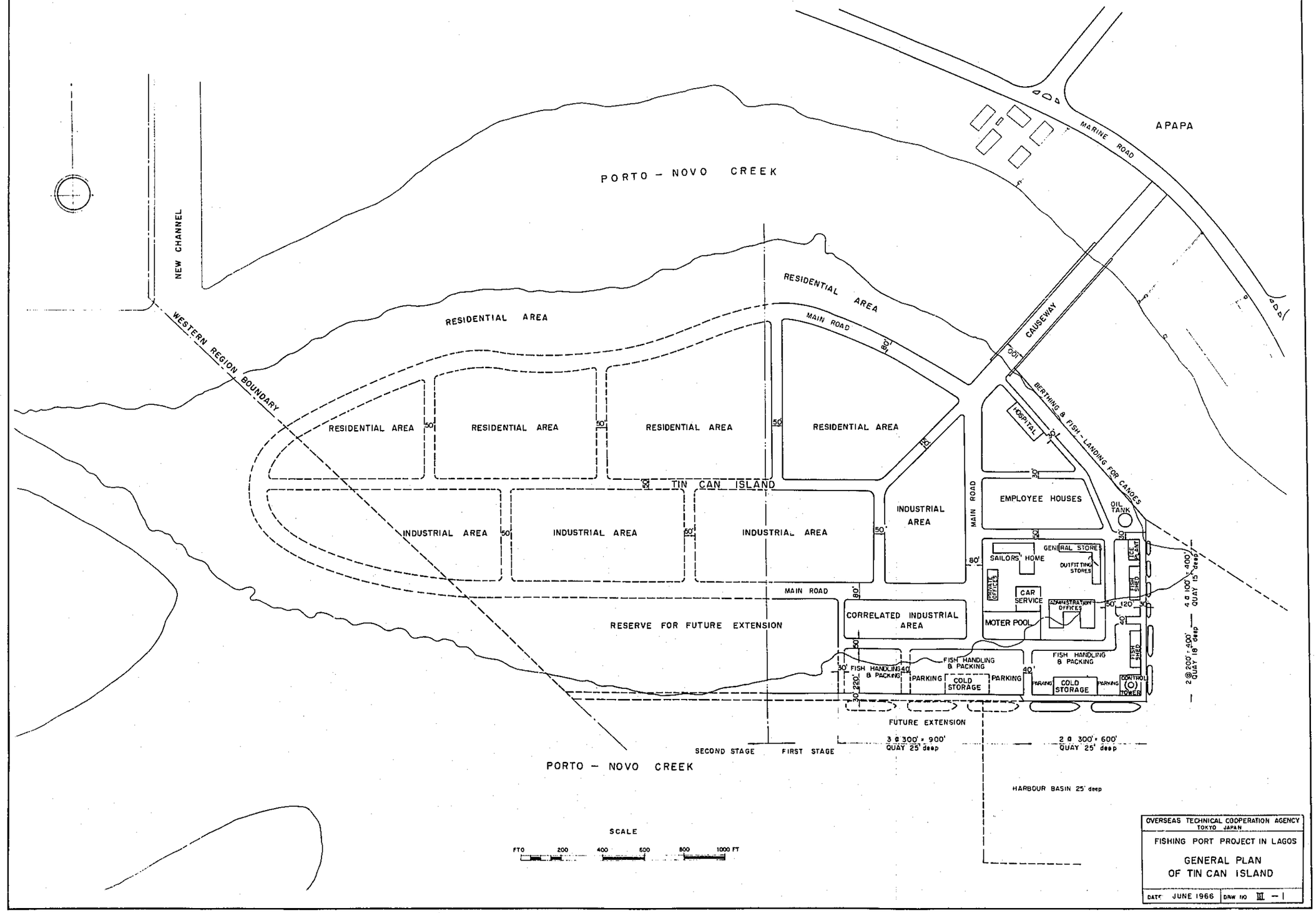


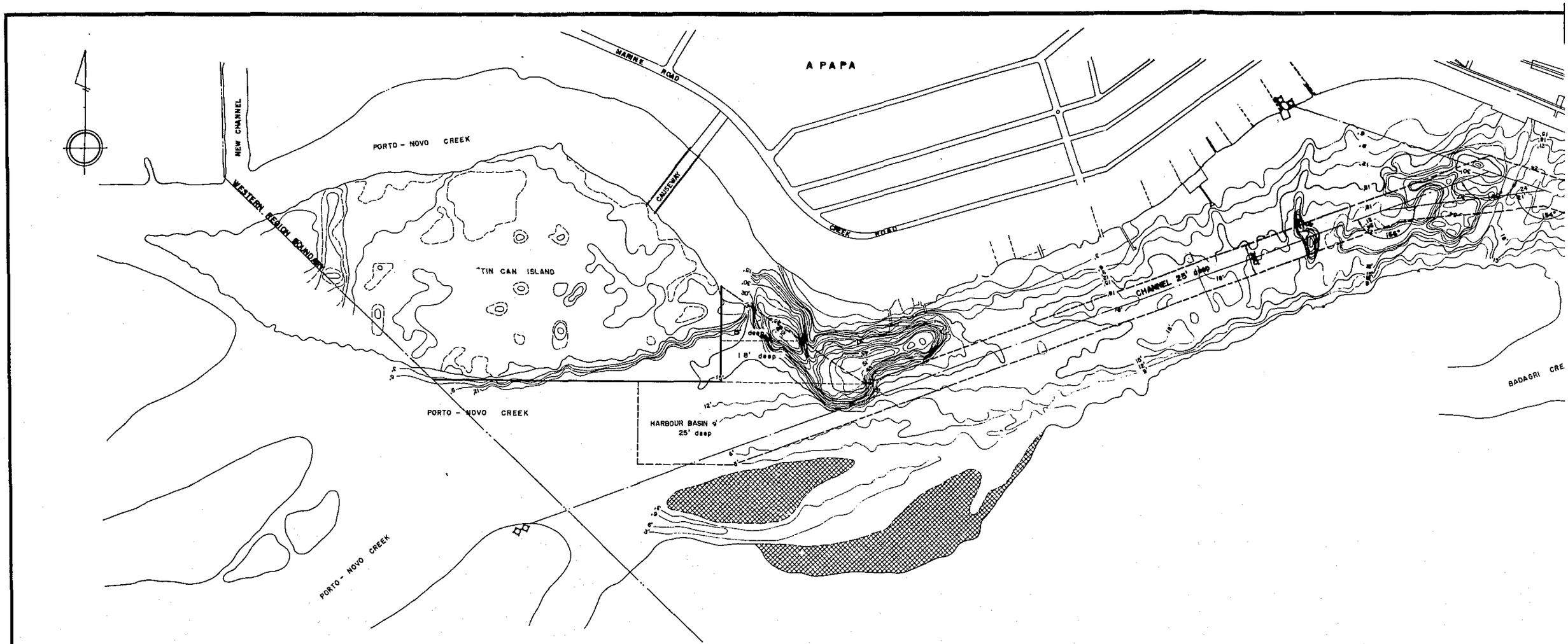
SIDE VIEW

JETTY

SCALE 0 5 10 15 20 25

OVERSEAS TECHNICAL COOPERATION AGENCY TOKYO JAPAN	
FISHING PORT PROJECT IN LAGOS	
TYPICAL CROSS SECTION OF QUAY AT IJORA SITE (CASE OF SHALE ROCK)	
DATE JUNE 1966	DRW. NO. I-3


PORTO – NOVO CREEK
NEW CHANNEL
WESTERN REGION BOUNDARY
APAPA
MARINE ROAD
CAUSEWAY
RESIDENTIAL AREA
RESIDENTIAL AREA
RESIDENTIAL AREA
RESIDENTIAL AREA
RESIDENTIAL AREA
MAIN ROAD
TIN CAN ISLAND
INDUSTRIAL AREA
INDUSTRIAL AREA
INDUSTRIAL AREA
INDUSTRIAL AREA
MAIN ROAD
RESERVE FOR FUTURE EXTENSION
CORRELATED INDUSTRIAL AREA
HOSPITAL
BERTHING & FISH-LANDING FOR CANOES
EMPLOYEE HOUSES
OIL TANK
GENERAL STORES
SAILORS' HOME
OUTFITTING STORES
ICE PLANT
FISH SHED
PRIVATE OFFICES
CAR SERVICE
ADMINISTRATION OFFICES
MOTER POOL
FISH HANDLING & PACKING
FISH HANDLING & PACKING
FISH HANDLING & PACKING
PARKING
COLD STORAGE
PARKING
PARKING
COLD STORAGE
PARKING
CONTROL TOWER
FISH SHED
FUTURE EXTENSION
SECOND STAGE
FIRST STAGE
3 @ 300' × 900' QUAY 25' deep
2 @ 300' × 600' QUAY 25' deep
2 @ 200' × 400' QUAY 18' deep
4 @ 100' × 400' QUAY 15' deep
HARBOUR BASIN 25' deep
PORTO – NOVO CREEK
SCALE
FT 0 200 400 600 800 1000 FT
OVERSEAS TECHNICAL COOPERATION AGENCY TOKYO JAPAN
FISHING PORT PROJECT IN LAGOS
GENERAL PLAN OF TIN CAN ISLAND
DATE JUNE 1966
DRW NO III – 1


MARINE ROAD
A PAPA
NEW CHANNEL
PORTO - NOVO CREEK
WESTERN REGION BOUNDARY
CAUSEWAY
CREEK ROAD
TIN CAN ISLAND
CHANNEL 25' deep
18' deep
PORTO - NOVO CREEK
HARBOUR BASIN 9'
25' deep
BADAGRI CRE
PORTO - NOVO CREEK

APAPA WHARF EXTENSION

CHANNEL 25' deep

BADAGRI CREEK

LIGHTHOUSE CREEK

Ogogoro

VICTORIA ISLAND

Reclamation Pump Station

SCALE

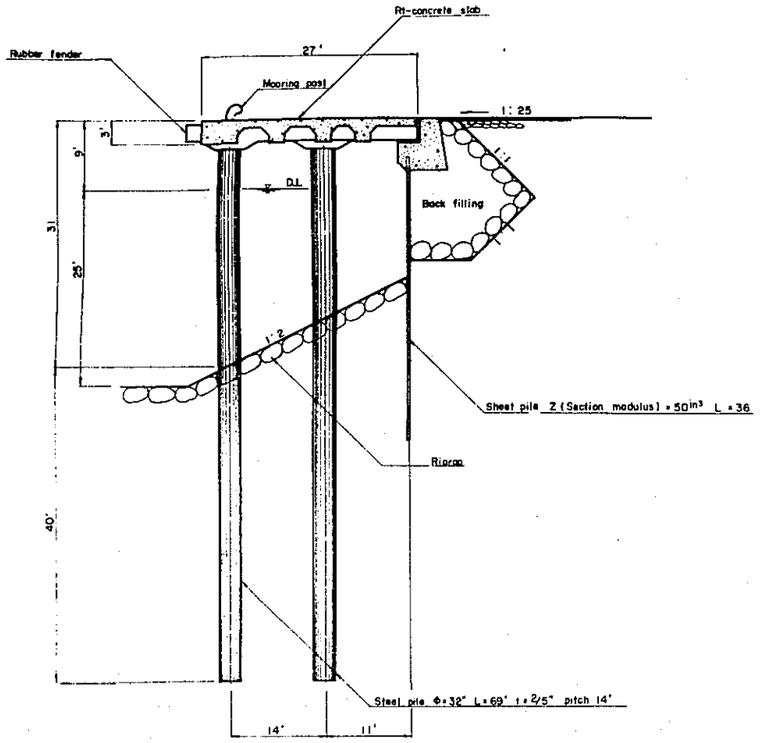
FEET 0 200 400 600 800 1000 1500 1800 1800 3000 FEET

OVERSEAS TECHNICAL COOPERATION AGENCY
TOKYO JAPAN

FISHING PORT PROJECT IN LAGOS

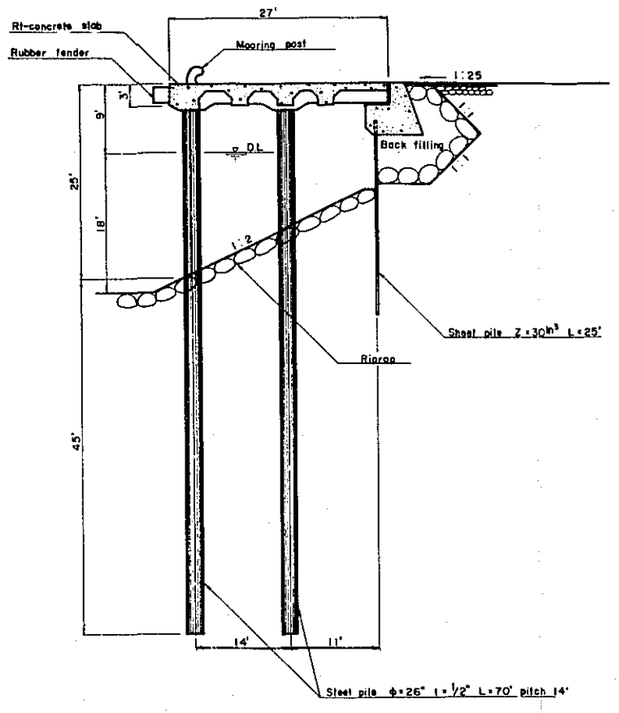
GENERAL PLAN OF THE APPROACH CHANNEL TO TIN CAN ISLAND

DATE JUNE 1966 DRW NO III - 2



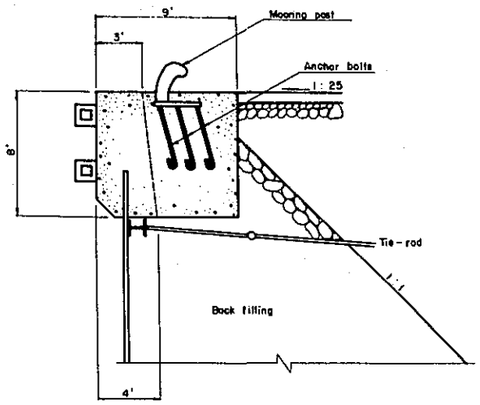
DEPTH OF 25 feet

SCALE 0 5 10 15 20 25



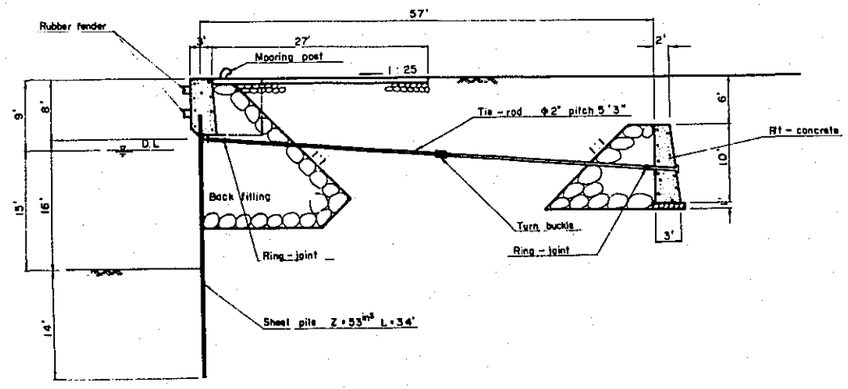
DEPTH OF 18 feet

SCALE 0 5 10 15 20 25



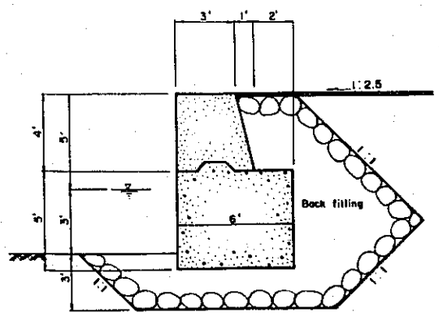
DETAIL OF CROWN

SCALE 0 2 4 6 8 10



DEPTH OF 15 feet

SCALE 0 5 10 15 20 25



BULKHEAD FOR CANOE

SCALE 0 2 4 6 8

OVERSEAS TECHNICAL COOPERATION AGENCY TOKYO JAPAN	
FISHING PORT PROJECT IN LAGOS	
TYPICAL CROSS SECTION OF QUAY AT TIN CAN ISLAND	
DATE JUNE 1966	DRW NO. II-3

(07)